Bureau of Materials and Physical Research

Quarterly Management Report on Research Progress

Quarter Ending March 31, 2006

INDEX

SPECIAL STUDIES

ILLINOIS CENTER FOR TRANSPORTATION

HIGHWAY RESEARCH COUNCIL

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Superpave Bituminous Mixture II - 4.75	Today's Date: 04/12/2006 Function Code: IHR-R06 Project Number:

QPR Author Name: Aaron Toliver Telephone: (217) 782 - 0564 | % Project Completed: 35%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Preliminary Distress Surveys at Project Locations	5/2003	8/2003			C	
Task 2: Field Testing and Construction Observation	8/2003	10/2000			C	
Task 3: Construction Data Compilation	10/2003	6/2004			C	
Task 4: Yearly Distress Surveys at Project Locations - 5 Yr.	5/2004	9/2008			I	
Task 5: Long Term Performance Data Analysis	9/2004	12/2008			I	
Task 6: Final Report and Recommendations	1/2009	4/2009			I	
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Aaron Toliver telephone: (217) 782 - 0564 e-mail:toliverat@dot.il.gov	IDOT - BMPR 126 E. Ash Street Springfield, IL 62704	Laura Shanley telephone: (217) 524 - 7269 e-mail:shanleyll@dot.il.gov

Description of Research: Evaluate the costs, constructability and performance of SUPERPAVE Bituminous Concrete Mixture IL - 4.75 (IL - 4.75). The results of this evaluation will be used to determine if IL - 4.75 is suitable for widespread application as a level binder on non-interstate highways. The findings may be used to suggest revisions to the IL - 4.75 contract special provision, or to suggest further research, if needed.	Keywords: SUPERPAVE, Sand Mix, IL-4.75, 4.75 mm NMAS, permeability, compaction, reflective cracking, overlay, blisters

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -		/ / / / / / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Superpave Bituminous Mixture II - 4.75	Today's Date: 04/12/2006
	Function Code: IHR-R06

Progress to Date (Limit narrative to what fits on this page):

Detailed preliminary surveys of existing pavement distresses at the four (4) test locations were conducted to determine the location, severity and probable causes of existing pavement distresses prior to overlay.

Data Collection Vehicles (DCVs) were dispatched to the test locations prior to construction for further assessment of preliminary pavement condition, including rutting and pavement smoothness. Follow-up surveys by the DCVs are to occur every year of the five (5) year study period, if funding permits; otherwise, DCV data collected every two (2) years for Condition Rating Surveys will be utilized.

Bid Tabulations were compiled for calculation of the initial construction costs.

Construction observation and field testing were completed at the test locations, with data collected regarding in-situ density and permeability, laboratory density, bituminous mix design, and aggregate gradation of the experimental and control level binders.

Frictional properties of the IL - 4.75 level binder were gathered at two (2) of the test locations for consideration of IL - 4.75 as a surface mix at a future date.

The process of compiling the pre-construction and construction field test data is complete.

The second of (5) five annual distress surveys at each location were completed in October 2005.

The second of (5) five annual DCV "follow-up" surveys at each location were completed in Fall 2005.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Te-30 High Performance Rigid Pavements - Alternative Dowel Bar Materials	Today's Date: 04/21/2006 Function Code: IHR-R Project Number:

QPR Author Name: Mark Gawedzinski, P.E. Telephone: (217) 782 - 2799 | % Project Completed: 80%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Monitor traffic and FWD data from five test sites	07/1996	/	I	I	I	I
Task 2: Perform initial FWD testing on fifth test site.	04/2005	10/2005	I	I	C	C
Task 3: Install round FRP dowel bars at fifth test site	08/2005	10/2005	I	I	C	C
Task 4: Install traffic classification system at fifth site.	10/2004	/	I	I	I	I
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Mark Gawedzinski, P.E. telephone: (217) 782 - 2799 e-mail:gawedzinskimj@dot.il.gov	IDOT BMPR 126 E. Ash St. Springfield, IL 62704	telephone: ( ) - e-mail:

Description of Research: Continued monitoring of alternative dowel bar materials in accordance with FHWA TE-30 High Performance Rigid Pavement Program.	Keywords: concrete pavement, alternative dowel bar, FRP dowels, FRP tubes, Stainless steel dowels, stainless steed tubes

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
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Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Evaluation Of Alternative Dowel Bar Materials (FHWA Te-30 Program)	Today's Date: / /
	Function Code: IHR-R

Progress to Date (Limit narrative to what fits on this page):

Monitoring traffic classification and FWD performance at four sites across Illinois. Installed elliptical steel dowel bars at a fifth site (10/2004) round FRP bars (9/2005). Waiting to complete installation of traffic classification system.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Semi-Flexible (Resin Modified) Pavement	Today's Date: 04/21/2006 Function Code: IHR-R06 Project Number:

QPR Author Name: Mark Gawedzinski, P.E. Telephone: (217) 782 - 2799 | % Project Completed: 85%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Develop and cast Open Graded Asphalt Bricks	06/2004	09/2005	C			
Task 2: Develop cement grout	02/2005	09/2005	C			
Task 3: Test RMP samples	04/2005	12/2005	I	C		
Task 4: Search for field trial.	09/2005	/		I	I	
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact: Mark Gawedzinski, P.E. telephone: (217) 782 - 2799 e-mail:gawedzinskimj@dot.il.us	P. I. Organization Name/Address: IDOT BMPR 126 E.	Co-Investigator Name/Contact: telephone: ( ) - e-mail:

Description of Research:	Keywords:

Technical **R**eview **P**anel Names:	**TRP** Telephone: ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -	**TRP** Email:	Meeting Dates: / / / / / / / / / / / / / / / /	Minutes Available?

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: State DOT"s, local agencies for asphalt areas prone to asphalt shoving.

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Semi-Flexible (Resin Modified) Pavement	Today's Date: 04/21/2006
	Function Code: IHR-R06

Progress to Date (Limit narrative to what fits on this page):

Researched cement grout using polycarboxilite super-plasticizers to achieve the same flow cone time as the two commercially available grout systems. Obtained samples of both commercially available systems (EucoDensit and PL-7 resin additive). Numerous sets of cement cubes have been cast to evaluate short term strength and freeze-thaw durability. Three sets of 2 - 6 inch diameter 3 inch high test samples have been tested in an Asphalt Pavement Analyzer (APA) @25,000 cycles @ 64 C dry, then 25,000 cycles @ 64 C submerged. The samples were tested using a 100 lb. wheel load with 100 psi. air pressure. None of the samples show any signs of degradation. One set was later subjected to steel wheel testing for 25,000 cycles @ 64 C, submerged. Four inch diameter cores and 2 inch cubes survived 300 F/T cycles. In the process of looking for field trials.

PROGRESS REPORT FOR THE QUARTER ENDING: MAR 2006

Project Title: **Special Studies** *Lighting, Sign and Signal Structure Problems (R07-1)*	Today's Date: 5/8/06 Function Code: IHR-R07 Project Number: FY 2006

QPR Author Name: Christopher Hahin, PE Telephone: (217) 782–0574 % Project Completed: 92%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Investigate Thin Wall Aluminum Pole Failures	3/02	12/03	C			
Task 2: Breakaway Couplings & Cast Iron Bases	7/02	6/04	C			
Task 3: Investigate Luminaire & Pole Vibration	7/02	12/05	C			
Task 4: Prepare Interim Reports	5/02	6/04	C			
Task 5: Investigate Stress Concentrations in Handholes	1/04	12/05	C			
Task 6: Propose New Pole & Base Designs	6/04	6/05	I			
Task 7: Recommend Changes to ILDOT Std Specs	6/04	12/05	C			
Task 8: Discuss new transformer base designs with TX DOT and FL DOT	10/04	9/05	I			
Task 9: Discuss and test brass breakaway couplings With TTI and other states	12/04	6/06	I			
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Christopher Hahin, PE telephone: (217) 782 – 0574 e-mail:	IL DOT Bureau of Materials & Research Springfield, IL 62704	telephone: ( ) - e-mail:

Description of Research: Determine the cause of cracking in various light poles, sign and signal structures by measuring residual and live load stresses originating from design, fabrication, welding and fit-up of telescoping, flange and other joints; investigate failures of aluminum, stainless, and steel light poles & luminaires, breakaway couplings, and the feasibility of fatigue-resistant cast iron pole bases with low impact toughness and electrical handholes.	Keywords: light poles; luminaires; fatigue; aluminum; cast iron; stainless steel; signals; sign structures

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Mark Seppelt	( ) -		/ /	
Jim Sterr	( ) -		/ /	
Jim Sullivan	( ) -		/ /	
Mike Renner	( ) -		/ /	
Jim Schoenherr	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Bureau of Operations; Bureau of Design & Environment

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: **Special Studies** *Lighting, Sign and Signal Structure Problems (R07-1)*	Today's Date: 5/8/06 Function Code: IHR-R07-1

Progress to Date (Limit narrative to what fits on this page):

Dec 2003: A meeting was held with representatives of HAPCO, a leading manufacturer of aluminum light poles, and the Bureaus and Districts concerned with recent pole failures. HAPCO described the basis for the newest AASHTO specifications on pole design. Another meeting with the contractors, vendors and suppliers was conducted to resolve the need for immediate replacement of failed poles under warranty. Their final proposal for pole replacement is to be submitted in late Jan 04 for review by the Department.

Mar 2004: A theoretical analysis confirmed the field measurements of 4-5 g forces sustained by luminaires on the LeClaire Bridge. Trucks passing at 55 mph or more create a localized pulse of 8-10 ms duration, resulting in both deck and pole deflection. Using the approximation of deck and pole deflection angle through the rigid parapet, g-forces were correlated to be a direct function of truck weight, speed and luminaire height.

Jun 2004: A final draft report regarding the luminaire failures on the I-80 Le Claire Bridge was completed, and reviewed by various officials in the Bureaus of Materials & Physical Research, Design & Environment, and Bridges and Structures. The final report was revised, and included virtually all of the reviewer's comments. Final printed report scheduled for release to Districts 2 and 4 in August, 2004.

Sep 2004: Final report submitted to District 2 regarding the I-80 luminaire failures. Recommendations included: 5g fixture is a minimum; shorten poles to 27.5 ft high; use galvanized steel poles which have better damping capacity; consider use of shaded parapet lighting; coat the pavement decking with masonry coatings with higher reflectivity. Sources of high-g lighting were also explored. A pooled fund proposal was placed on the Internet to solicit assistance from other states with similar luminaire vibration problems.

Dec 2004: Reviewed proposal of manufacturer (sent from BDE) to changes of hand hole geometry, including: full penetration welds, thicker casting, and grinding of weld profile. Would slightly increase fatigue category, but high stress concentration at hole in pole would still be excessive at high wind speeds.

Mar 2005: Reviewed proposal of University of Illinois Dept of Civil Engineering regarding cyclic testing of aluminum, steel and fiber composite 40 ft light poles to determine amplitude, frequency and damping effects.

June 2005: Extensive changes to Article 1069 of Illinois Standard Specifications were submitted to the Bureau of Design regarding materials and light pole & tower design. Deflection limits in high mast poles and hand hole stress concentrations were subject to in-depth analysis. Report of results expected in next quarter.

Sep 2005: Single piece lighting pole design, consisting of a telescoping cast base, with handhole, then welded to the tapered pole, was discussed with D&E Electrical Unit. Design has fewer sites for fatigue or overload from high winds. I-80 luminaire vibration study published. Awaiting report of vibration studies of aluminum, steel and fiberglass poles from the University of Illinois.

Dec 2005: Final draft report received from the Univ of IL regarding pole vibration studies. Feedback received from pole manufacturers regarding proposed changes to IL Standard Specifications; extensive changes to be placed in Special Provision form.

Mar 2006: Draft report of Univ of IL was reviewed, and its deficiencies were provided to the Bureau of Design. Discussions of drop-weight impact testing of individual couplings were conducted with MPM Technologies regarding energy absorption of free-cutting brass breakaway couplings. Coupling design was completed and materials were received. A test of the Hapco vibration-resistant pole for the I-80 bridge at Le Claire was discussed with WJE, Inc., a testing firm from Oak Brook, IL. Test was scheduled for the 4th Quarter of FY 2006.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Evaluation Of A Fiber Reinforced Polymer (Frp) Composite Bridge Deck Material. Ibrc # Il98-08	Today's Date: 4/19/2006 Function Code: IHR-R07 Project Number: ITRC FY

QPR Author Name: Tom Winkelman Telephone: (217) 782 - 2940 % Project Completed: 75%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Literature search for FRP composite materials	1/2000	12/2001	C	C	C	
Task 2: Innovative feature workplan preparation	3/2000	10/2001	C	C	C	
Task 3: Observe bridge deck construction	7/2001	12/2001	C	C	C	
Task 4: FRP material testing	1/2002	12/2006	I	I	I	
Task 5: Bridge deck instrumentation	3/2003	8/2003	C	C	C	
Task 6: Construction report	4/2002	9/2002	C	C	C	
Task 7: Performance evaluations	12/2001	12/2006	I	I	I	
Task 8: Final report	10/2006	6/2007				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Tom Winkelman telephone: (217) 782 - 2940 e-mail:winkelmantj@dot.il.gov	Illinois DOT - BM & PR 126 East Ash Street Springfield IL 62704	telephone: ( ) - e-mail:

Description of Research: This research will involve evaluating the construction and field performance of a fiber reinforced polymer (FRP) composite bridge deck material. Literature searches on composite materials and their related material and physical properties. Observation of the construction process and field evaluation of the completed bridge deck. Laboratory testing of samples from the composite material. A construction report and final report will be written to document the performance of this experimental material.	Keywords: bridge deck, fiber reinforced polymer composite, "DURASPAN"

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -		/ / / / / / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: IDOT - BBS, LR & S, Districts New material for smaller bridges New specifications

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Evaluation Of A Fiber Reinforced Polymer (Frp) Composite Bridge Deck	Today's Date: 4/19/2006
	Function Code: IHR-R07

Progress to Date (Limit narrative to what fits on this page):

2003 1st Quarter
Color, gloss, and hardness tests were completed on the remaining material samples. Compression, tensile, and flexural strengths along with resin content and water absorption will be completed in the second quarter.

2003 2nd Quarter
Compression, tensile, and flexural strength testing was completed. Resin content and water absorption tests were also completed. Plans were started for the instrumentation of the bridge deck and girders with strain gauges.

2003 3rd Quarter
The bridge deck and select girders were instrumented with strain gauges. A static load test was performed and the strain levels recorded. It was determined that the deck and girders are acting as a composite unit.

2003 4th Quarter
An annual performance survey was completed in December. All material tests for this year were completed.

2004 1st Quarter
Color, gloss, and hardness tests were completed on the remaining material samples. Compression, tensile, and flexural strengths along with resin content and water absorption will be completed in the second quarter.

2004 2nd Quarter
Resin content and water absorption tests were completed. Compression, tensile, and flexural strength tests were delayed due to scheduling and availability of the laboratories.

2004 3rd Quarter
No activity.

2004 4th Quarter
An annual performance survey was completed in December, and the annual reporting form was submitted to the FHWA. All material tests for this year were completed.

2005 1st Quarter
Color, gloss, and hardness tests were completed on the remaining material samples. Compression, tensile, and flexural strengths along with resin content and water absorption will be completed in the second quarter.

2005 2nd Quarter
Resin content and water absorption tests were completed during this quarter.

2005 3rd Quarter
No activity.

2005 4th Quarter
The annual performance distress survey was completed, and the necessary reporting forms completed. Areas of distress and split joints were found on the underside of the FRP bridge deck at some of the manufactured joints. The compression, flexural, and tension testing was completed as the test machines in the laboratories are operational again.

2006 1st Quarter
No activity.

PROGRESS REPORT FOR THE QUARTER ENDING SEPTEMBER 2005

Project Title: Experimental Features In A Pcc Pavement: Fibrous Concrete, Tining, No-Seal Joints, And Alternative Dowel Bars. Experimental Feature II 99-04	Today's Date: 10/17/2005 Function Code: IHR-R07 FY 2006

QPR Author Name: Tom Winkelman Telephone: (217) 782 - 2940 % Project Completed: 85%	Estimated Dates		Calendar Year: 2005			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Literature search for similar research	1/2000	10/2000	C	C	C	
Task 2: Observe construction practices	7/2000	12/2000	C	C	C	
Task 3: Construction report	10/2000	4/2001	C	C	C	
Task 4: Field evaluation of project performance	7/2000	06/2005	I	C	C	
Task 5: Final report	06/2005	12/2005			I	
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Tom Winkelman telephone: (217) 782 - 2940 e-mail:winkelmantj@dot.il.gov	Illinois DOT - BM & PR 126 East Ash Street Springfield IL 62704	telephone: ( ) - e-mail:

Description of Research: This research will involve the field evaluation of four different experimental features in a PCC pavement project. The concrete pavement will include polypropylene fibers for reinforcement, no-seal transverse pavement joints, uniform transverse tining, randomly spaced transverse tining, randomly spaced skewed tining, and some alternative materials for dowel bars. Literature searches on the various experimental features listed above. Observation of the construction process and regular field evaluations of the completed pavement. A construction report, interim report, and final report shall be written to monitor the performance of these features.	Keywords: Concrete, Polypropolene fibers, tining, no-seal joints, dowel bars

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -		12/14/1999 / / / / / / / / / / / / / /	No

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
Construction Report (1/1/2001)	Illinois DOT New construction procedures New specifications

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Experimental Features In A Pcc Pavement: Fibrous Concrete, Tining, No-	Today's Date: 10/17/2005
	Function Code: IHR-R07

Progress to Date (Limit narrative to what fits on this page):

2003 1st Quarter
No activity.

2003 2nd Quarter
The second annual distress survey was performed in June. No significant distress was found.

2003 3rd Quarter
No activity.

2003 4th Quarter
No activity.

2004 1st Quarter
No activity.

2004 2nd Quarter
The third annual distress survey was performed in May. No significant distress was found. A request was made to District 2 for a copy of the QC/QA report from the construction of this project.

2004 3rd Quarter
No activity.

2004 4th Quarter
No activity.

2005 1st Quarter
No activity.

2005 2nd Quarter
The fourth annual distress survey was performed in May. No significant distress was found.

2005 3rd Quarter
A draft of the final report was started during this quarter.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Hot Mix Asphalt Longitudinal Joint Sealants	Today's Date: 4/19/2006 Function Code: IHR-R07 Project Number: ITRC FY

QPR Author Name: Tom Winkelman Telephone: (217) 782 - 2940 % Project Completed: 50%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Literature Search of Product Use and Experience	5/2003	6/2004	C	C	C	
Task 2: Project Construction	8/2003	10/2003	C	C	C	
Task 3: Construction Report	1/2004	6/2004	C	C	C	
Task 4: Project Evaluations	10/2003	10/2008	I	I	I	
Task 5: Interim Report	1/2007	6/2007				
Task 6: Final Report	10/2008	6/2009				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Tom Winkelman telephone: (217) 782 - 2940 e-mail:winkelmantj@dot.il.gov	Illinois DOT Bureau of Materials and Research 126 E. Ash Springfield IL 62704	Laura Shanley telephone: (217) 524 - 7269 e-mail:shanleyll@dot.il.gov

Description of Research: The goal of this research is to evaluate the performance of two longitudinal joint sealants for hot mix asphalt pavements. The two products under evaluation are "J-Band" from Heritage Research Group and "Quik-Seam" from Hendy Products, Inc. Documentation of the construction procedures and performance measures including density at the joint and permeability will be evaluated. Annual performance checks will be used to monitor the performance of the two materials.	Keywords: Hot Mix Asphalt, Longitudinal Joints, Sealants, J-Band, Quik-Seam, Density, Permeability

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
David Lippert	(217) 782 - 2631		/ /	
Jim Trepanier	(217) 782 - 9607		/ /	
Laura Shanley	(217) 524 - 7269		/ /	
Tom Winkelman	(217) 782 - 2940		/ /	
	( ) -		/ /	
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			/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Hot Mix Asphalt Longitudinal Joint Sealants	Today's Date: 4/19/2006
	Function Code: IHR-R07

Progress to Date (Limit narrative to what fits on this page):

2003 2nd Quarter
Research has just been initiated. Project has been selected on IL Rt. 26 in Stephenson County.

2003 3rd Quarter
Three official projects have been selected and constructed as part of the research. The first project is located on Illinois Route 50 (Cicero Avenue) in District 1. The second project is located on Illinois Route 26 in District 2, and the third is located on Interstate 57 in District 1. All three projects were constructed during the third quarter. The first two projects incorporated both types of joint sealant, while the third project only used the J-Band material. All three projects were tested for field permeability at the joint, and were cored for laboratory testing.

2003 4th Quarter
A fourth project was constructed on Interstate 70 during the third quarter and added to the research. This project used only the J-Band material. Laboratory testing and some initial work on the construction report were also completed during this quarter.

2004 1st Quarter
Work on the construction report has continued. Field evaluations of the projects will be conducted this summer.

2004 2nd Quarter
A field evaluation of the project on IL Rt. 26 north of Freeport was completed in May. No significant comparison results were found at this project.

2004 3rd Quarter
Field evaluations were completed for the experimental projects constructed on Interstate 70 near Martinsville, Interstate 57 near Peotone, and Illinois Route 50 near Matteson. No significant comparison results were found on any of the projects. A construction report documenting all four experimental projects was completed.

2004 4th Quarter
No activity to report.

2005 1st Quarter
No activity.

2005 2nd Quarter
Field evaluations were completed for the experimental projects constructed on Illinois Route 26, Illinois Route 50, and Interstate 57. Some parallel centerline cracking was noted in the J-Band section of Illinois Route 26. No significant comparison results were found on the remaining projects.

2005 3rd Quarter
No activity to report.

2005 4th Quarter
A field evaluation was completed for the experimental project on Interstate 70. No joint distress was found.

2006 1st Quarter
No activity to report.

PROGRESS REPORT FOR THE QUARTER ENDING: MAR 2006

Project Title: **Engineering and Technical Investigations** *Welded Notch Toughness Test (R09-1)*	Today's Date: 5/8/06 Function Code: IHR-R09 Project Number: ITRC FY 2006

QPR Author Name: Christopher Hahin, PE		Estimated Dates		Calendar Year: 2006			
Telephone: (217) 782- 0574	% Project Completed: 90%			JAN	APR	JUL	OCT
Task Title		Start	Complete	MAR	JUN	SEP	DEC
Task 1: Apply welded notch test to high performance steels		1/01	6/02	C			
Task 2: Apply welded notch test to other steels and non-ferrous metals		6/02	9/06	I			
Task 3: Write technical manual for fabricators & researchers for use of test		1/02	3/06	I			
Task 4: Publish findings in ASM, AWS and other technical journals		2/03	3/06	C			
Task 5: Propose test for inclusion into ILDOT specs and AWS code		7/03	12/06	I			
Task 6:		/	/				
Task 7:		/	/				
Task 8:		/	/				
Task 9:		/	/				
Task 10:		/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Christopher Hahin, PE telephone: (217) 782 – 0574 e-mail:	IL DOT Bureau of Materials & Research Springfield, IL 62704	telephone: ( ) - e-mail:

Description of Research:	Keywords:
The welded notch toughness test determines the actual toughness of a welded joint by joining two beveled base plates with a small land area (4 mm typical) of similar or dissimilar metals. When welded together in a rigid fixture, they form a natural, sharp notch. Welding conditions can be controlled to measure the effects of voltage, amperage, travel speed, electrodes, different welding processes or various combinations of base metals. Beveling 30 deg on each plate results in a 60° included angle, providing a CVN-style weld joint; or, if one plate has a 45° bevel and the other is square-cut, the toughness of the HAZ can be found. Test fixture is portable, and provides high shrinkage restraint for welded plates.	welded notch test; toughness; weld joints; weldments; steel; Charpy V-notch; heat-affected zone; HAZ

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -		/ / / / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
"As-Welded Notch Toughness Test for Steel Weldments", *Welding Journal*, Vol 70, No 2, Feb 91, pp 47-54.; "Welded Notch Toughness Testing", *Advanced Materials & Processes*, Feb 2005, pp 49-52.	Bureaus of Bridges & Structures; AWS; ASTM; AASHTO

Instructions for each field appear at the bottom of the screen. For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: **Engineering and Technical Investigations** *Welded Notch Toughness Test (R09-1)*	Today's Date: 5/8/06 Function Code: IHR-R11

Progress to Date (Limit narrative to what fits on this page):

Dec 2002: Welded notch toughness testing of Duracorr (ASTM A1010 stainless steel) and ER309L weldments at 30 kJ/in heat input with 60° V-grooves and 4 mm land area notches show a uniform ASTM E23 Charpy style V-notch toughness of 60 ±3 ft-lbs in the temperature range of –10°F to +70°F. Weld metal impact was also 60 ft-lbs at 0°F, which is obtained by notching the machined, flat weld bead and impacting the natural notch side by the striker tup. This uniformity of CVN toughness at 60 ft-lbs in the range of –10°F to +70°F indicates that this weldment is still at the upper shelf of the sigmoidally-shaped energy absorption curve.

Mar 2003: The welded notch and HAZ notch toughness tests were included in Special Provisions specified for the IL83 & US 45 Bridge over the Wisconsin Central RR to determine the effects of substituting materials, or changing certain essential variables, on the toughness of weldments of ASTM A710 Grade B high performance steel. Essential variables described in Section 5 of the AWS D1.5 Bridge Welding Code include: (a) changes in filler metals; (b) sizes of electrodes or their classification; (c) changes in polarity, heat input or gas shielding [e.g., change from CO_2 to argon-oxygen cover gases], and (d) preheat temperatures.

June 2003: Work on this project delayed due to higher priority efforts in D-1 and D-8.

Sep 2003: Work on this project delayed due to higher priority efforts in D-1, D-2, D-4 and D-8.

Dec 2003: Work on this project delayed due to higher priority efforts for D-1, D-2, D-4, D-8 and the Bureau of Design & Environment.

Mar 2004: An abstract was forwarded to ASM International's Fabricated Structural Steel Symposium, to be presented in October 2004, outlining the use of the welded notch toughness in determining the toughness of weldments of A710 Grade B for use in general structural work.

Jun 2004: Abstract previously submitted was accepted by ASM International, and presentation of the topic was scheduled for delivery at the ASM International Materials Conference in Columbus, OH in October 2004. Work on an article regarding welding of ASTM A710 Grade B was started, intended for submission to the journal *Advanced Materials and Processes*.

Sep 2004: A technical paper was submitted and accepted for inclusion in the ASM International Conference on Fabricability of High Performance (HP) Steels in Columbus, OH, entitled "Welded Notch Toughness Testing of ASTM A710 Grade B HP Steel". The paper is scheduled to be published in the November issue of *Advanced Materials and Processes.*

Dec 2004: Publication delayed until Feb 2005 by ASM International. Sent graphic of cable-stay Mississippi Bridge in St. Louis to journal editor per her request; bridge to use HP steels.

Mar 2005: Article, "Welded-Notch Toughness Testing", authored by principal investigator, published in February, 2005 issue of *Advanced Materials & Processes*, pp-49-52, in the "Tech Spotlight" section.

June 2005: An invited presentation was given at the Univ of Illinois Civil Engineering Seminar Series regarding the use of the welded notch toughness in qualifying weldments for ASTM A710 Grade B high performance steel.

Sep 2005: Discussed with Bureau of Bridges & Structures inclusion of welded notch toughness test into Standard Specifications as a supplemental test to standard AWS tests.

Dec 2005: Work on this project delayed due to higher priority efforts in D-1.

Mar 2006: Work on this project delayed due to higher priority efforts in D-1, D-9, D-2 and D&E.

PROGRESS REPORT FOR THE QUARTER ENDING: MAR 2006

Project Title: **Engineering and Technical Investigations** *Development of a Tough Alloy Structural Steel (R09-1)*	Today's Date: 5/8/06 Function Code: IHR-R16 Project Number: ITRC FY 2006

QPR Author Name: Christopher Hahin, PE		Estimated Dates		Calendar Year: 2006			
Telephone: (217) 782- 0574	% Project Completed: 92%			JAN	APR	JUL	OCT
Task Title		Start	Complete	MAR	JUN	SEP	DEC
Task 1: Perform weldability studies		7/00	6/02	C			
Task 2: Investigate use in bridges, sign & signal structures; rebars		10/01	6/03	C			
Task 3: Propose new ASTM or AASHTO specifications for use of alloy		1/02	9/04	C			
Task 4: Prepare tech data document for applicability of ASTM A710 Grade B		5/02	6/06	I			
Task 5: Machinability studies of high performance steels		9/03	12/05	I			
Task 6: Determine temperature range for heat straightening for A710 Grade B		4/05	4/06	C			
Task 7:		/	/				
Task 8:		/	/				
Task 9:		/	/				
Task 10:		/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Christopher Hahin, PE telephone: (217) 782 – 0574 e-mail:	IL DOT Bureau of Materials & Research Springfield, IL 62704	telephone: ( ) - e-mail:

Description of Research	Keywords
Using an earlier high performance (HP) steel developed by Northwestern Univ. on behalf of FHWA and US Navy, its composition was modified by BMPR and ASTM Committee A01.02. This HP steel has 0.03-.09% C, with 1.3% Cu, 1.0% Ni, 0.7% Mn and 0.4% Si. Its toughness is typically 100 ft-lbs or more at sub-freezing temperatures. The alloy represents a major development in hot-rolled HP steels, not require quenching & tempering or other thermo-mechanical processing. Normalizing may be specified for very high toughness. The cost/ton is directly competitive with conventional weathering steel (ASTM A588). Application into various bridges and other structures requires further exploration.	alloy steel; high performance; copper; nickel; low carbon; toughness; weathering steel; bridges; structures

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -		/ / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
"High Performance Copper-Precipitation Hardened Steel", *Microalloyed Steels 2002, ASM Intl Materials Solutions Conference*, 7-9 Oct 02, Columbus, OH	Bureaus of Bridges & Structures; ASTM; AASHTO

Instructions for each field appear at the bottom of the screen. For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: **Development of a Tough Alloy Structural Steel**	Today's Date: 5/8/06
	Function Code: IHR-R16

Progress to Date (Limit narrative to what fits on this page):

Dec 2003: Comparisons of the machinability of A36, A710 Grade B and A709 HPS 70W, using high speed steel and TiN coated end mills, is in progress at Machining Research, Inc. Interim report expected in Feb 04.

Mar 2004: Face milling studies of A710 and A709 high performance steels indicate a surprisingly superior finish with high performance steels vs. A36 when using a fly-cutter with carbide insert. Surfaces are equivalent to ground finishes. Roughness on A36 was expected compared its free-machining counterpart SAE 12L14 due to its greater number of laminated particles of carbide and ferrite (pearlite). Since both A709 and A710 have substantially lower carbon (0.08-0.10%C), it is thought that their more uniformly harder matrix makes the milled surface much smoother. In these steels, the fly cutter does not abruptly run into hard pearlite clusters, and then a softer ferrite, as in A36. For carbon steels with 0.20-0.40 %C, this results in a peak-and-valley cut. Also, the ductility of the chip in A36 also does not lend itself to an even surface cut. The results for A710 and A709 indicate that fly-cut milling virtually eliminates the need for grinding in most structural work; resulting in a significant cost savings.

Jun 2004: Machining Research has completed all the work on end milling of HP steels, including A710 Grade B, using high speed steel bits. Progress on end milling using carbide bits is proceeding, and a report is to be made available on end milling in July, 2004. Various standard and special drills are being acquired to complete the last phase of the experimental portion of this project.

Sep 2004: Machining Research provided a comprehensive report on the milling phase of the high performance (HP) steel machinability study. Compared to A36, A710 HP and A709 HP steels had better milled surfaces, and cutting them resulted in less wear on end mills, improving their life and cutting time. These improvements are attributed to the limited amount of iron carbide and more uniform distribution of hardness compared to conventional A36 structural steel.

Dec 2004: Progress is continuing on comparative studies of drilling of HP steels, based on twist and core drill wear. Estimated completion, late March or early April 2005.

Mar 2005: Industrial Steel of Gary, IN, selected as the fabricator for the IL-83 bridge over the CNRR. Inquiry as to whether heat straightening could be used to increase camber. Since no data is available as to effects of precipitation-hardening of this alloy on toughness, 700F was recommended as highest permissible temperature. Study to determine temperature effects contemplated. Principal investigator from Machining Research reports severe illness; no progress on drilling to date.

Jun 2005: Machining Research has acquired hollow point Hougen drills for high performance steel drilling study; principal investigator reports partial recovery from illness. Toughness tests conducted by Northwestern Univ indicate that heat straightening of A710 Grade B up to 1200F did not affect notch toughness, but will increase yield & tensile strength, and a small decrease in ductility.

Sep 2005: Drilling tests still in progress at Machining Research. Toughness tests at 70F at BMPR of A710 Grade B subjected to 1 hr of exposure at 900F, 1000F, and 1050F showed only an 8% loss of the as-received average CVN toughness of 168 ft-lbs.

Dec 2005: No progress reported from Machining Research. Telephone and fax inquiries were sent on 1/17/06 to determine whether the principal investigator can perform work, or have one of his associates complete the remainder of the drilling studies. Offers to help in completing final report were also made.

Mar 2006: A joint technical article, authored by C. Hahin, PI of this work unit, S. Vaynman and M. Fine of Northwestern Univ, and C. Crosby of Industrial Steel Corp., was submitted to *Modern Steel Construction* regarding the use of A710 Grade B in the IL-83 Bridge over the CNRR, was accepted for publication. Editor has requested more photographs for the article.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Shrp Products Evaluation And Ltpp Support	Today's Date: 4/19/2006 Function Code: IHR-R19 Project Number: ITRC FY

QPR Author Name: Tom Winkelman Telephone: (217) 782 - 2940 % Project Completed: 75%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Attend National and Local SHRP/LTPP meetings	1/1990	12/2009	I			
Task 2: Maintenance of LTPP test sections within Illinois	1/1990	12/2009	I			
Task 3: Performance testing of LTPP test sections within Illinois	1/1990	12/2009	I			
Task 4:	/	/				
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Tom Winkelman telephone: (217) 782 - 2940 e-mail:winkelmantj@dot.il.gov	Illinois DOT - BM & PR 126 East Ash Street Springfield IL 62704	telephone: ( ) - e-mail:

Description of Research: The objective of this study is to evaluate those Strategic Highway Research Program (SHRP) products that have been identified as having potential of being a benefit to the department. The primary benefit of this study will be the identification and implementation of those SHRP products that will be cost effective to the department resulting in cost-savings, increased service life, and/or safety improvements.	Keywords:

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
David L. Lippert	( ) - (217) 782 - 6732 ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -	lippertdl@dot.il.gov	/ / / / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Performance Data Manuals of Practice New Procedures

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Shrp Products Evaluation And Ltpp Support	Today's Date: 4/19/2006
	Function Code: IHR-R19

Progress to Date (Limit narrative to what fits on this page):

2004 1st Quarter
Laboratory testing was completed for cores taken from Test Sections 175151, 179267, 175849, and 175423. Test results were reported to Stantec in February. Stantec performed a final round of testing for Test Section 175908 on Illinois Route 13 in District 9 as this section will be dropped from the program this summer.

2004 2nd Quarter
Traffic control was established for annual testing at 6 test section locations. Construction was started and completed for the new WIM Scale on Interstate 57 at the SPS-6 site in Pesotum.

2004 3rd Quarter
Traffic control was established for annual testing at 3 test section locations. The I-57 WIM scale was ground for smoothness, and the pavement profile was checked. The annual Illinois update meeting was held on August 27.

2004 4th Quarter
International Road Dynamics was selected as the contractor to install the I-57 WIM scale.

2005 1st Quarter
An on-site meeting was held with IRD to review the selected WIM installation site. Work has progressed on the necessary items needed to complete the installation. A letter was sent to each of the Districts with an LTPP site asking for future rehabilitation plans and asking them to update the BMPR with any maintenance activities to the sites. An LTPP project update presentation was made at the Pavement Engineers meeting.

2005 2nd Quarter
Work progressed on the requirements and scheduling of the WIM installation on Interstate 57 at Pesotum. A meeting was held with the RSC to coordinate the materials action plan for sampling of the SPS-6 site on Interstate 57. This sampling was postponed until summer 2006.

2005 3rd Quarter
The WIM installation and calibration was completed in late July through early September. Traffic control was coordinated for the RSC at the SPS-6 site as well as sites in District 4 and 2.

2005 4th Quarter
No activity to report.

2006 1st Quarter
Maintenance activities were recorded for the SPS-6 sections on Interstate 57 near Champaign. The coring and data collection activities for the SPS-6 Materials Action Plan were scheduled for April.

PROGRESS REPORT FOR THE QUARTER ENDING: MAR 2006

Project Title: **Integral Abutment Bridges**	Today's Date: 5/8/06 Function Code: IHR-R20 Project Number: ITRC FY 2006

QPR Author Names: Christopher Hahin Telephone: (217) 782-0574 % Project Completed: 79%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Attach gages on piles, decks, diaphragms and girders	7/00	6/02	C			
Task 2: Collect strain gage & tilt sensor data	7/01	12/02	C			
Task 3: Propose and investigate improved geometry and details	1/02	9/03	C			
Task 4: Prepare Interim Reports	5/02	3/06	I			
Task 5: Cyclic yielding of embedded subsize piles	10/02	7/04	C			
Task 6: Recommend Changes to ILDOT Design Specs	12/02	6/07	I			
Task 7: Select candidate experimental bridge	7/05	9/06	I			
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Christopher Hahin, PE telephone: (217) 782 – 0574 e-mail:	IL DOT Bureau of Materials & Research Springfield, IL 62704	telephone: ( ) - e-mail:

Description of Research: In an integral abutment bridge, thermal expansion and contraction is absorbed by the piles supporting the abutment instead of expansion joints. In this project, integral abutments are instrumented with strain gages installed on the piles of various bridges at locations throughout Illinois at 8 different depths to observe the stresses induced by expansion and contraction. Other gages were mounted in the deck, on girders, and at the interface between the abutment and abutment diaphram where gages are installed on the vertical reinforcement bars. Additional study will include improvement of present designs to decrease cyclic stresses sustained by pilings and abutment diaphragm.	Keywords: integral abutments; strain gages; driven piles; thermal expansion; contraction

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Kevin Reichers	( ) -		/ /	
David Greifzu	( ) -		/ /	
Ralph Anderson	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Bureaus of Bridges & Structures

Instructions for each field appear at the bottom of the screen. For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: **Integral Abutment Bridges**	Today's Date: 5/8/06
	Function Code: IHR-R20

Progress to Date (Limit narrative to what fits on this page):

Sep 2002: Discussions with personnel from the Bureau of Bridges & Structures (BBS) indicated their desire to have the bridge approach slab connected to the abutment. Because of our concerns about contraction during cold weather, there should be an ability for the slab to remain connected, but provide expansion with lubricated dowels or other types of connectors. Pile behavior in various soils and their unpredictability have caused concern as to undetected cracking of pile caps, since they are not visible for inspection. Discussions were conducted about embedding small I-beams in concrete blocks of 8 cu ft, and cycling them to slightly beyond their yield strength. This would reveal how cracking spreads in the concrete. Further discussions were held with Kevin Reichers and Salah Khayyat of BBS regarding our proposals to separate the pile cap from the beam end cap with lubricated plates of austenitic stainless steel (AISI Types 304 or 316), permitting very substantial movements without creating any yielding phenomena in the pile cap.

Dec 2002: Preliminary outline developed for interim report. Construction and testing of small beam embedded in rigid concrete blocks delayed until Spring 2003.

Mar 2003: Work commenced on the interim report, summarizing the various characteristics of each site, outputs of strain gages at certain times of the year, and daily fluctuations. Test results indicate that behavior of the pile is dependent on the soil pressures of the subsoil horizons, and is not always a cantilever-shaped deformation with a point of fixity at a particular depth. In the Tennessee design, select backfill is used to obain a more uniform deformation, although they reported yielding at the pile end cap.

Jun 2003: An interim draft report summarizing previous work has been prepared, and is presently undergoing review and revision. Completed draft for final peer review scheduled for Sep 2003.

Sep 2003: Work on this project delayed due to higher priority efforts in D-1, D-2, D-4 and D-8.

Dec 2003: Work delayed due to transfer of associate investigator Volkman to D-8.

Mar 2004: Work delayed due to higher priority Departmental work.

Jun 2004: Work delayed due to higher priority Departmental work.

Oct 2004: Work delayed due to higher priority Departmental work. Proposed semi-integral design should be incorporated into an Innovative Bridge project in the near future, preferably in D-8 since the previous assistant investigator transferred there. This recommendation will be incorporated into the final report to provide continuity to carry out these concepts.

Dec 2004: Work delayed due to higher priority Departmental work.

Mar 2005: Work delayed due to higher priority Departmental work.

June 2005: Inquiry made to David Greifzu of the Bureau of Bridges as to whether an integral abutment bridge design could incorporate designs recommended in this study as an experimental feature.

Sep 2005: Work delayed due to higher priority Departmental work in D-1.

Dec 2005: Work delayed due to higher priority Departmental work in D-1.

Mar 2006: After discussion with Bureau of Bridges, the choice of an experimental bridge to be coordinated with W. Kramer and K. Reichers to incorporate modifications of standard IL practices for integral bridges.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Mechanistic-Empirical Design Implementation & Monitoring For Flexible Pavements	Today's Date: 3/21/06 Function Code: IHR-R28 Project Number:

QPR Author Name: Marshall R. Thompson Telephone: (217) 333 - 3930 | % Project Completed: 75%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Provide technical support and cooperate with IDOT concerning M-E flexible pavement design.	07/05	06/06	I	I	I	
Task 2:	/	/				
Task 3:	/	/				
Task 4:	/	/				
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Marshall R. Thompson telephone: (217) 333 - 3930 e-mail:mrthomps@uiuc.edu	Department of CEE University of IL @U-C	telephone: ( ) - e-mail:

Description of Research: Mechanistic-Empirical (M-E) -based flexible pavement design concepts and procedures were developed in previous IHR Projects (IHR-510 and IHR-527) and have been implemented by IDOT. IDOT continues to support a variety of M-E design implementation and monitoring activities. The objective of this project is for University of Illinois Staff to continue to provide technical support and cooperate with IDOT in these activities.	Keywords: Flexible Pavements; Mechanistic-Empirical Design

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
David Lippert	(217) 782 - 2631 ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -	LippertDL@nt.dot.state.il.us	/ / / / / / / / / / / / / /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
Letter memos/reports on as-needed/requested basis	All IDOT Districts / Improved flexible pavement design

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: M-E Design Implementation & Monitoring For Flexible Pavements	Today's Date: 3/21/06
	Function Code: IHR-R28

Progress to Date (Limit narrative to what fits on this page):

* Thompson provided responses to questions/comments received from IDOT concerning flexible pavement analysis and design.

* Thompson continued to interact with IDOT M&PR in developing/improving PCCP Rubblization policies, specifications, construction procedures, M-E flexible pavement design concepts/procedures, and AC overlay thickness design concepts.

* Thompson is cooperating with IDOT in reviewing/modifying proposed Local Roads & Streets M-E design procedures for FULL-DEPTH AC and Conventional Flexible Pavements. Thompson continues to review the March -2005 BLR&S Section 37 (Pavement Design). Review comments will be forwarded to IDOT.

* Thompson continues to provide engineering services/advice to IDOT concerning the D-9 I-57 Rubblization/HMA Overlay project (Franklin - Williamson Counties). He participated in a "site visit / District Review" on January 27, 2006.

* Thompson provided engineering services/advice to IDOT concerning the I-55 project (I-80 north to Bolling Brook) concerning Full-Depth HMA M-E design of the third lane addition.

* Several critical inputs/policy decisions concerning M-E design of flexible pavements (Bureau of Design / Bureau of Local Roads and Streets) have been identified. Thompson is helping to consider these issues and Amy Schutzbach is coordinating IDOT's efforts to consider these issues.

* Thompson participated in the IDOT/UofI working sessions (January, 2006) at the University of IL concerning M-E design of Extended Life HMA Pavements.

* Several critical inputs/policy decisions concerning M-E design of flexible pavements (Bureau of Design / Bureau of Local Roads and Streets) have been identified. Thompson is helping to consider these issues and Amy Schutzbach is coordinating IDOT's efforts to consider these issues.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Validation of Extended Life HMA Design Concepts - Nondestructive Pavement Evaluation Using Illi-Pave Based Ann Models	Today's Date: 02/27/2006 Function Code: IHR-R39 Project Number:

QPR Author Name: Telephone: ( ) -	% Project Completed: %	Estimated Dates		Fiscal Year: 2006			
				JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title		Start	Complete				
Task 1: Characteristics of Illinois Pavements		08/2004	/				
Task 2: Generating ILLI-PAVE Finite Element Solutions		10/2004	/				
Task 3: Development of ANN Structural Analysis Models		12/2004	/				
Task 4: Validation of the ANN Models		04/2005	/				
Task 5: Preparing A User-Friendly Toolbox (Software)		06/2005	/				
Task 6: Final Report and Training/Implementation		/	/				
Task 7:		/	/				
Task 8:		/	/				
Task 9:		/	/				
Task 10:		/	/				

Principal Investigator Name/Contact: telephone: ( ) - e-mail:	P. I. Organization Name/Address:	Co-Investigator Name/Contact: telephone: ( ) - e-mail:

Description of Research: Evaluating structural condition of existing, in-service pavements is a part of the routine maintenance and rehabilitation activities undertaken at IDOT. In the field, the pavement deflection profiles gathered from the FWD test data are typically used to evaluate pavement structural conditions. This kind of evaluation requires the use of backcalculation type structural analysis to determine pavement layer stiffnesses and as a result estimate pavement remaining life. The recent use of artificial neural network models trained with ILLI-PAVE finite element solutions has proved to give much better results then the statistical algorithms currently in use.	Keywords: Artificial Neural Networks, ILLI-PAVE Nonlinear Finite Element Analysis, Falling Weight Deflectometer, Backcalculation of Layer Modulus

Technical **R**eview **P**anel Names:	**TRP** Telephone: ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) - ( ) -	**TRP** Email:	Meeting Dates: / / / / / / / / / / / / / / / /	Minutes Available?

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Nondestructive Pavement Evaluation Using Illi-Pave Based Ann Models	Today's Date: 02/27/2006
	Function Code: IHR-R39

Progress to Date (Limit narrative to what fits on this page):

Preliminary analyses were first undertaken to determine the effects of considering lime stabilized subgrades on the deflections and critical responses in the pavement profile. The results were quantified in terms of pavement engineering properties and the responses predicted were compared to those with no lime treatment, which had previously been obtained. It was found that some of the responses in the lime-stabilized sections (such as deflections under the FWD load) were considerably different, which deemed the further detailed analyses of lime-stabilized sections necessary.

The detailed analyses considered wider ranges of the pavement layer thicknesses and material properties. Approximately 30,000 new runs were made using the ILLI-PAVE finite element program for the analyses of Conventional Flexible Pavements on the lime-stabilized soils (CFP_LSS). An additional 26,000 new runs were also made for the Full Depth Flexible Pavements on the lime-stabilized soils (FDP_LSS). Two types of Artificial Neural Network (ANN) models were developed using the generated data: (1) to predict deflections and critical pavement responses (so called forward calculation ANN models) using the pavement geometry and material properties as inputs and (2) to estimate the material properties and thicknesses of pavement layers using FWD deflections (backward calculation ANN models). For each type of ANN models, several sub-models were also developed for potentially estimating more accurately the different pavement layer properties at a time for the same pavement section.

Field FWD data of the lime stabilized sections, mainly FAI 57 -ULLIN road, some sections of FA 409 road, FA 808 High Cross Road, and ATREL test sections, have so far been analyzed using the developed ANN models as part of our efforts to validate the prediction ability of the ANN models. Meanwhile, comparisons of the predicted results from the lime-stabilized sections with the ones from no lime modification are in progress to further indicate the improvement in predictions achieved by considering lime stabilized subgrades in the analysis.

An important progress has also been made in the area of pavement layer thickness estimation using ANNs. New and more robust ANN models have been succesfully developed to improve ways in thickness estimation and to make thickness determination a viable ANN application by only using deflection values obtained from FWD testing.

The ANN forward and backward calculation structural analysis toolbox, ANN_Pro v1.0 software, has been further developed and tested by running various cases. Creation of a help file is currently in the works to make even an inexperienced user to be able use the program without much difficulty. Some of the graphing options have also been enhanced to make the interpretation of the analysis results more meaningful. Moreover, an option to export the data to a worksheet in Microsoft Excel or a document in Microsoft Word is currently being developed. The ANN_Pro v1.0 program can now run more than 1 ANN model at a time to enable running multiple analyses, which was made possible after importing the developed ANN models for CFP, FDP, CFP_LSS and FDP_LSS.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Validation Of Extended Life Pavement Design Concepts	Today's Date: 4/14/2006 Function Code: IHR-R39 Project Number:

QPR Author Name: S.H. Carpenter Telephone: (217) 333 - 4188 | % Project Completed: 70%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Laboratory Testing	07/2004	03/2006	I	I	C	
Task 2: Response Testing	07/2004	06/2005	C			
Task 3: Field Fatigue Testing	07/2004	06/2006	I	I	I	
Task 4: AC Overlay/Tack Coat Study	10/2004	05/2005	C			
Task 5: Artificial Neural Network (ANN) Back Calculation	07/2004	06/2006	I	I	I	
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Samuel H. Carpenter telephone: (217) 333 - 4188 e-mail:scarpent@uiuc.edu	Dept of Civil and Envir. Engn 205 N Mathews, MC-250 Urbana, IL 61801	M. R. Thompson telephone: (217) 333 - 3930 e-mail:mrthomps@uiuc.edu

Description of Research:	Keywords:
This research will provide test data for dynamic modulus and fatigue for current IDOT mixes in accordance with the AASHTO 2002 data requirements for pavement design. The fatigue testing will validate fatigue altgorithms and illustrate the existence and magnitude of a fatigue endurance limit. Constructed pavements will be tested for responses and fatigue behavior. Artificial Neueral network technology will be investigated for use in interpreting FWD data to provide a more rapid and accurate method for obtaining layer moduli values.	Extenaded Life, endurance limit, ANN, dynamic modulus, pavement responses

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Scott Lackey	(217) 466 - 7263	lackeysa@dot.il.gov	09/04/2002	Yes
Jim Trepaniert	(217) 782 - 9607	trepanierjs@dot.il.gov	04/22/2003	Yes
Richard Mauch	(618) 346 - 3300	mauchrc@dot.il.gov	03/04/2004	Yes
Hal Wakefield	(217) 492 - 4646	hal.Wakefield@fhwa.dot.gov	08/24/2004	Yes
Paul Neidernhofer	(217) 524 - 1651	niedernhoferpr@dot.il.gov	11/08/2005	Yes
LaDonna Rowden	(217) 782 - 8582	rowdenlr@dot.il.gov	/ /	
Amy Schutzbach	(217) 785 – 4888	schutzbacham@dot.il.gov	/ /	
David Lippert	(217) 782 - 6732	lippertdl@dot.il.gov		
Tom Winkelman	(217) 782 - 2940	winkelmantj@dot.il.govj		

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
	IDOT pavement design engineers

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

Project Title: Validation Of Extended Life Pavement Design Concepts	Today's Date: 04/14/2006
	Function Code: IHR-R39

Progress to Date (Limit narrative to what fits on this page):

Task 1. Laboratory Testing. No further laboratory testing is planned. InNitial reports have been submitted. The laboratory data is being analyzed.

Task 2. Response Testing. Completed.No ATLAS response testing was done. FWD response testing was conducted during this quarter

Task 3. Field Fatigue Testing. Over 43,000 load repetitions were applied to the 6 inch fatigue section. Fatigue cracking developed over the first 25 feet of the section during the past quarter. Crack maps and rut depth measurements have been taken during the testing. After repair to ATLAS, the seaction will be tested in the third quarter to induce failure in the remaining length of the section. ATLAS has been checked out and is completing testing on existing flexible pavements, and should be available for ELHMAP testing in early May to complete the failure test sequences.

Task 4. Completed.

Task 5. Artrificial Neural Network (ANN) Back Calculation.

Preliminary analyses were first undertaken to determine the effects of considering lime stabilized subgrades on the deflections and critical responses in the pavement profile. The results were quantified in terms of pavement engineering properties and the responses predicted were compared to those with no lime treatment, which had previously been obtained. It was found that some of the responses in the lime-stabilized sections (such as deflections under the FWD load) were considerably different, which deemed the further detailed analyses of lime-stabilized sections necessary.

The detailed analyses considered wider ranges of the pavement layer thicknesses and material properties. Approximately 30,000 new runs were made using the ILLI-PAVE finite element program for the analyses of Conventional Flexible Pavements on the lime-stabilized soils (CFP_LSS). An additional 26,000 new runs were also made for the Full Depth Flexible Pavements on the lime-stabilized soils (FDP_LSS). Two types of Artificial Neural Network (ANN) models were developed using the generated data: (1) to predict deflections and critical pavement responses (so called forward calculation ANN models) using the pavement geometry and material properties as inputs and (2) to estimate the material properties and thicknesses of pavement layers using FWD deflections (backward calculation ANN models). For each type of ANN models, several sub-models were also developed for potentially estimating more accurately the different pavement layer properties at a time for the same pavement section.

Field FWD data of the lime stabilized sections, mainly FAI 57 -ULLIN road, some sections of FA 409 road, FA 808 High Cross Road, and ATREL test sections, have so far been analyzed using the developed ANN models as part of our efforts to validate the prediction ability of the ANN models. Meanwhile, comparisons of the predicted results from the lime-stabilized sections with the ones from no lime modification are in progress to further indicate the improvement in predictions achieved by considering lime stabilized subgrades in the analysis.

An important progress has also been made in the area of pavement layer thickness estimation using ANNs. New and more robust ANN models have been successfully developed to improve ways in thickness estimation and to make thickness determination a viable ANN application by only using deflection values obtained from FWD testing.

The ANN forward and backward calculation structural analysis toolbox, ANN_Pro v1.0 software, has been further developed and tested by running various cases. Creation of a help file is currently in the works to make even an inexperienced user to be able use the program without much difficulty. Some of the graphing options have also been enhanced to make the interpretation of the analysis results more meaningful. Moreover, an option to export the data to a worksheet in Microsoft Excel or a document in Microsoft Word is currently being developed. The ANN_Pro v1.0 program can now run more than 1 ANN model at a time to enable running multiple analyses, which was made possible after importing the developed ANN models for CFP, FDP, CFP_LSS and FDP_LSS.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Traffic Operations Lab (Tol)	Today's Date: 3/31/06 Function Code: IHR-R43 Project Number:

QPR Author Name: Rahim (Ray) Benekohal Telephone: (217) 244 - 6288 % Project Completed: 25%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Task 1: Signal Coordination & Timing Workshops:	7/05	7/06	I	I	I	
Task 2: TOL Web site and Computer Network:	7/05	7/06	I	I	I	
Task 3: Battery Back-up Systems testing and evaluations:	7/04	9/05	C			
Task 4: Task 4. Meetings and Trainings	7/05	7/06	I	I	I	
Task 5: Task 5. Installation of Video Detection systems:	4/05	7/05	C			
Task 6: Task 6. Data Collection Procedure	7/05	10/06	I	I	I	
Task 7: Task 7. Data Analysis	7/05	9/07	I	I	I	
Task 8: Task 8. Final report	7/06	10/07		I	I	
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Prof. Rahim (Ray)Benekohal telephone: (217) 244 - 6288 e-mail:rbenekoh@uiuc.edu	U of I Urbana Champaign 205 N. Mathews Ave. Urbana, IL 61801 (USA)	n/a telephone: ( ) - e-mail:

Description of Research: The TOL activities are mainly focused on testing and evaluation of new traffic control devices, on investigative and solution oriented research to recommend countermeasures to problems faced in traffic operations, and on providing the hands-on training to the department and municipal employees as well as the students at the university. The main focus of this year's research is evaluation of video detection systems. Regular activities on hands-on training will continue.	Keywords: video detection, loop detection, traffic control devices; UPS for traffic signals, LED,

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
	( ) -		/ /	
Yogi Gautam	(217) 782 - 3452	gautamyp@	3/10/06	No
Jim Schoenherr	(217) 782 - 3450	schoenherrja@	2/10/06	No
Jason Johnson	(217) 557 - 2070	johnsonjl@	10/4/05	No
	( ) -		11/17/05	No
	( ) -		12/15/05	No
	( ) -		/ /	
	( ) -			

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
UPS Evaluation Reports	Evaluation of UPS, Loop detectors, and video detection systems

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Traffic Operations Lab	Today's Date: 3/31/06
	Function Code: IHR-R43

Progress to Date (Limit narrative to what fits on this page):

The scope of activities at TOL is broad and encompasses more than a specific research project. Some tasks listed on previous page are projects in the traditional sense and others are on going activities. The following summarizes the progress on each task.

Task 1: Signal Coordination and Timing (SCAT) Workshops- Two SCAT workshops for the district and central office IDOT employees were conducted in Sept 2005 at TOL. Computer network connection to TOL was updated and Synchro software was installed on the server. Computers were tested to make sure all working and ready for the classes.

Task 2: TOL Web site and Computer Network- TOL network was connected with fiber optics to the main ATREL building to have high speed internet connection. All PCs were linked to the internet through the new server.

Task 3: Battery Back-up Systems (BBS) testing and evaluations- This task was the main focus of work at the lab last year. A report was approved and published in July 2005.

Task 4. Meetings and Training - The yearly statewide Highway Lighting and Traffic Signals meetings was held on November 16-18, 2005. The meeting was hosted and presentations were made on the video detection study and BBS. IDOT Haz Mat training and Brown Traffic User Group meetings are planned for April 2006.

Task 5. Installation of Video Detection (VD) systems - Three vendors provided their video detection systems for evaluation. A signal cabinet is installed on Route 45 to house the VD systems. The three cameras and 6 inductive loop detectors were installed. Computers and input/output devices to measure the performance of the VD systems were installed. The data collection equipment were tested and adjusted. A statewide Signal System Engineers meeting on the VD system installed was held on July 8th, 2005.

Task 6. Data Collection Procedure - Scenarios to collect data were decided in cooperation with IDOT staff. A variety of light, traffic, and weather conditions will be considered. An algorithm was developed to find errors in VD systems compared to loop detectors. The algorithm has been validated by viewing video images and the algorithm's output. A set of data was colleted and processed. The results were sent to the vendors so they can fine tune the VD setting, if needed. Vendors came and fine tuned their systems. Further modifications are being made to the algorithm. Data collection began in November 2005.

Task 7. Data Analysis- The collected data is being analyzed and the errors will be quantified. Four errors are tabulated: false detection, missed detection, stuck-on call, and dropped call. Contributions of light, weather, and traffic parameters on errors will be determined.

Task 8. Final report- Prepare a final report to include the finding of the study.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Performance And Acceptance Of Self-Consolidating Concrete	Today's Date: 3/16/2006 Function Code: IHR-R44 Project Number:

QPR Author Name: D.A. Lange Telephone: (217) 333 - 4816 | % Project Completed: 95%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Literature Review	7/2003	1/2004				
Task 2: Selection of Candidate Mix Designs Using Illinois Material Sources	8/2003	4/2004				
Task 3: Evaluate Applications	8/2003	4/2005				
Task 4: Experimental Program I – Flow Characteristics	10/2003	4/2006	I	I	I	
Task 5: Experimental Program I – Segregation Study	10/2003	4/2006	I	I	I	
Task 6: Experimental Program II – Early Age Mechanical Performance	10/2003	4/2006	I	I	I	
Task 7: Experimental Program II – Long Term Mechanical Performance	10/2003	4/2006	I	I	I	
Task 8: Test Protocol and Acceptance Criteria	10/2004	6/2006	I	I	I	
Task 9: Coordination Meetings	7/2003	7/2006	C	C	C	
Task 10: Final Report	6/2006	7/2006				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Prof. David Lange telephone: (217) 333 - 4816 e-mail:dlange@uiuc.edu	University of Illinois 2122 NCEL, MC-250 Urbana, IL 61801	Leslie Struble telephone: (217) 333 - 2544 e-mail:lstruble@uiuc.edu

Description of Research:	Keywords:
IDOT has expressed interest in developing SCC materials for use in precast/prestressed member construction and possibly for future use in cast in place construction. Coordination with Illinois precast industry and admixture companies will be maintained through this project. The study will use IDOT-approved materials for potential mix designs that will be used for evaluation of fresh and hardened properties of SCC. Test methods and protocols will be evaluated and acceptance criteria will be proposed. Partnership of IDOT and UIUC expertise serves the central goal of defining successful SCC mixtures and construction practices that can deliver acceptable material properties.	SCC, performance, flow, segregation, creep, shrinkage

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Brian Pfeifer, Chair BMPR	(217) 782 - 2912	PfeiferBA@dot.il.gov	11/18/2005	Yes
Doug Blades FHWA	(217) 492 - 4629	Doug.Blades@fhwa.dot.gov	2/20/2004	Yes
James Krstulovich BMPR	(217) 782 - 6733	krstulovichjm@dot.il.gov	5/12/2004	Yes
Ken Lang D3	(815) 434 - 8480	langkr@dot.il.gov	7/20/2004	Yes
Kevin Riechers BB&S	(217) 782 - 9109	riecherskl@dot.il.gov	11/19/2004	Yes
Steve Worsfold D4	(309) 671 - 3676	worsfoldsj@dot.il.gov	4/5/2005	Yes
	( ) -		7/1/2005	Yes
	( ) -			

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
SCC Prestressed Applications 4-14-05	IDOT BMPR Final Report-- June 2006

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Performance And Acceptance Of Self Consolidating Concrete	Today's Date: 3/16/2006
	Function Code: IHR-R44

Progress to Date (Limit narrative to what fits on this page):

Project accomplishments to date include a review of the current literature and available test methods. Current trends in mix design have been evaluated and a database of over 150 concrete mixtures was compiled. Candidate control mixtures were selected that represent different strategies in SCC mixture proportioning. The mixtures include one SCC design suitable for PPC I-beams w/ VMA and a conventional I-beam mix design, as well as IDOT mixtures used in Peoria retaining wall projects.

Laboratory testing is in progress to characterize material behavior in both the fresh and hardened states. UIUC began by fabricating test equipment for the various SCC methods. Segregation test methods involving eddy current, falling weights, and image analysis have been used in the laboratory for validation. A test method was developed for evaluating static stability using hardened concrete cylinders. A static segregation test probe has also been developed, which is a simple device to quickly measure static segregation in the field. For dynamic segregation, a tilted 6"x6"x6' wooden channel is currently in use to examine flow over longer distances. Some concretes with zero VSI from the slump flow test show dynamic segregation in this test, which may indicate greater sensitivity to dynamic segregation. Field measurement is planned after design refinement. A series of tests were performed using commercial ready mix SCC. The slump flow ranged from 19 to 30 inch. It was found several mixes with zero VSI from slump flow test showed dynamic segregation in our test. Several mixtures with "0" (good) stability rating with the Segregation Probe also showed dynamic segregation. Field measurements and reproducibility tests are planned in the future.

Early age creep and shrinkage measurements are completed for the candidate SCC mixtures. Long term creep and shrinkage characterization continues. Elastic modulus tests in compression are completed for all materials. Elastic modulus tests in tension are ongoing. Current testing involves variation of the stress level to define a more robust creep function. Autogenous shrinkage, thermal behavior, and internal RH have been measured to assess early age cracking potential. A new experiment characterizes differential shrinkage stresses by measuring curling in an unrestrained beam and the relative humidity profile. A finite element model has been developed to characterize stress development at early age. The model has been validated using the differential drying shrinkage test. Current uses of this model for different scenarios in the laboratory and the field are being investigated. One potential application of our model is to extract creep parameters from simple laboratory experiments for use as a test protocol and SCC mixture validation test. Concrete core specimens were taken from the UIUC strong wall to analyze dynamic segregation. The results are being studied using the segregation shrinkage model to determine the shrinkage potential and investigate the causes for cracking. A numerical simulation of heat development in the wall may also give some insight into the causes for cracking.

Formwork pressure measurements continue in the laboratory and in the field. Tests have been conducted to compare an alternative measurement system for the field. The sensors will be easier to install in the field and are relatively inexpensive. Column tests have been conducted to study how these sensors compare to the current system. A large amount of field data were obtained from IDOT engineers in Peoria. That data are currently being analyzed to validate the proposed model. Also, the data are being used to study the effect of concrete temperature on the pressure decay curve. This will be used to develop a parameter in the model to adjust for differences between the temperature in the column test and the temperature of the concrete in the field. A document prepared for ACBM summarizes the state of formwork pressure research including data and approaches taken by other researchers. This document will be combined with 2 others from ACBM for publication concerning the state of SCC research.

This project has been an active partnership with the Bureau of Materials and Physical Research at IDOT. Regular meetings have been held to provide updates on research progress. The project is conducted by two 1/2-time research assistants under the direction of Prof. David Lange. These students are Matthew D'Ambrosia and Ben Birch. A third 1/2-time research assistant, Lin Shen, is studying fresh properties and segregation under the supervision of Prof. Leslie Struble.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Concrete Distress Identification	Today's Date: 03/14/2006 Function Code: IHR-R53 Project Number: R53

QPR Author Name: Qiang Li Telephone: (217) 244 - 2355 % Project Completed: 30%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Review mineralogy of chert and flint in general and chert in Illinois	10/2005	12/2005	I	I	C	
Task 2: Review alkali-silica reactivity of flint and chert.	10/2005	12/2005	I	I	C	
Task 3: Review geologic origin of cherts occurring in sand deposits in Illinois	01/2006	03/2006	I	I	C	
Task 4: Investigate two sets of natural sand and C 1293 test specimens	04/2006	06/2006				
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Leslie J. Struble telephone: (217) 333 - 2544 e-mail:lstruble@uiuc.edu	Civil and Environmental Engineering, University of Illinois, 2129 Newmark, 205 N. Mathews, Urbana IL, 61801	telephone: ( ) - e-mail:

Description of Research: The research work is to determine whether there are microstructural or crystal-chemical features by which one can distinguish reactive chert from non reactive chert.	Keywords:

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Brian Pfeifer Doug Dirks James Krstulovich	(217) 782 - 2912 (217) 782 - 7208 (217) 782 - 6733 ( ) - ( ) - ( ) - ( ) - ( ) -	pfeiferba@dot.il.gov dirksda@dot.il.gov krstulovichjm@dot.il.gov	12/16/2005 / / / / / / / / / / / /	Yes

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Concrete Distress Identification	Today's Date: 03/14/2006
	Function Code: IHR-R53

Progress to Date (Limit narrative to what fits on this page):

We submitted the report on the petrographic examination of core samples from I-39. Although there is no visible gel found, the presence of reactive silicas (e.g. chert, strained quartz) indicates the potential ASR deterioration for the samples. For the chert project, we contacted Dr. Lasemi in ISGS to identify some locations for sample collection. Based on the literature review, the cherts in Illinois are all in form of nodules, occurring in host limestones and dolomites. Most evidence indicates that the cherts originated from replacement of host carbonate rocks.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Illinois Center For Transportation (Ict)/ Deck Beams	Today's Date: 3/31/2006 Function Code: IHR-R54 Project Number:

QPR Author Name: Dan Kuchma Telephone: (217) 333 - 1571 | % Project Completed: 27%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Survey of Current State Practice	07/2005	11/2005	C			
Task 2: Survey of Practice in Other States	09/2005	06/2006	I	I	I	
Task 3: Review of Bases for Guidelines	10/2005	05/2006	I	I	I	
Task 4: Design of Research Program	10/2005	06/2006	I	I	I	
Task 5: Conduct Experimental Research	12/2005	03/2007		I	I	
Task 6: Analysis and Summary of Test Results	05/2006	06/2007				
Task 7: Produce IDOT Guidelines	04/2007	09/2007				
Task 8: Production of Final Report	07/2007	12/2007				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Dan Kuchma telephone: (217) 333 - 1571 e-mail:kuchma@uiuc.edu	CEE Department, UIUC 205 N. Mathews Ave, Urbana, IL 61801	Chris Hart telephone: (217) 244 - 8791 e-mail:chart3@uiuc.edu

Description of Research: Lifting loops for bridge decks typically consist of one or more 7-wire prestressing strands that have been bent into loops. Current national codes and handbooks do not provide guidance for the design of lifting loops for shallow members and consequently individual states and producers are using a variety of different methods. This has led to problems in the field including failure of loops and this poses a significant safety hazard. To address this concern, current practices are being reviewed and a range of lifting loop arrangements are being tested in order to develop a standard practice for IDOT with potential national application.	Keywords: lifting, safety, prestressed concrete, bridges

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Brian Pfeifer	(217) 782 - 2912	pfeiferba@dot.il.gov	09/13/2005	Yes
Kevin Riechers	(217) 782 - 9109	riecherskl@dot.il.gov	/ /	
Gary Kowalski	(217) 785 - 2914	kowalskigm@dot.il.gov	/ /	
John Ciccone	(217) 782 - 9111	cicconejl@dot.il.gov	/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	
	( ) -		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
Preliminary Test Plan 11/16/05	Reviewed and Revised

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

Project Title: Illinois Center For Transportation (Ict)/ Deck Beams	Today's Date: 3/31/2006
	Function Code: IHR-R54

Progress to Date (Limit narrative to what fits on this page):

Task 1: Survey of Current State Practice

Section 2 of the IDOT Prestressed Deck Beams Manual was reviewed to gather information controlling the design and placement of lifting loops. This included geometric and reinforcement details for 11 and 17 inch deep deck beams.

Using contact information provided by Brian Pfeifer, a survey was conducted of the current lifting loop practices of 5 producers. These included Egyptian Concrete (Gerry Broom), Prestressed Engineering Corporation (Dave Burkitt), County Materials (Mike Johnson), Iowa Prestress Company (Jeff Welter), and St. Louis Prestress (Jim Kovarik). The results from the survey were synthesized and used in conjunction with IDOT specified lifting loop configurations to select variables for the proposed first phase of the experimental research program. These included the number of strands, size and use of piping, shape of lifting loops, and diameter of lifting pins.

Task 2: Survey of Practice in Other States

At this time, only practices of the producers listed above have been reviewed. A broader survey will be conducted in the third and fourth quarters of this project.

Task 3: Review of Bases for Guidelines

The basis for the guidelines provided in the PCI Design Handbook are being reviewed.

Task 4: Design of Research Program

The experimental research program was proposed to be conducted in two phases. Phase I will consist of a preliminary testing program in which a broad range of lifting loop arrangements and connections will be investigated. The goal of this first series of tests is to identify problems in current practice and promising features of a standard. The second phase of the experimental research will be aimed at assessing the specific requirements and limits of potential standard practice(s).

A draft plan was developed for the preliminary testing program and this plan was reviewed by the IDOT technical panel. A total of 16 tests were proposed, one test in each corner of an 8' foot long solid concrete slab. Two of the slabs will be 11 inches deep and two will be 17 inches deep. Variables in the test include the number of 7-wire strands (1 or 2), the shape of the loops (parallel or tied), the use of a pipe (none, 1/8" pipe, thinner electrical conduit), and the diameter of the lifting pin (hook, 2" diameter pin). Each slab will contain the minimum number of strands required for the associated depth of deck slab and the standard specified level of transverse and end reinforcement. In all tests, the lifting angle will be 45 degrees.

The test setup will consist of a central jack that rests on top of the deck slab at mid-span and presses upwards on the 7 wire strands that are connected at one end to a test loop and on the other end to an over designed anchor at the far end of the slab. This is a simple self-equilibrating test setup that will produce lifting forces in end regions that well represent the forces that are applied in practice. The slabs will be cast and tested in the Newmark structural engineering laboratory.

Task 5: Conduct Experimental Research

The preliminary testing plan was reviewed by the IDOT technical review panel and the necessary changes in the testing plan were made. Over the past two months, the more detailed design of the first four test specimens and the test set-up was completed and reviewed internally. This detailed plan will be sent to the technical review panel in early April with a meeting to follow in Springfield in April at a time mutually agreed upon between the UIUC research team and the technical review panel.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Tack Coat Optimization for Overlays	Today's Date: 04/03/2006 Function Code: IHR-R55 Project Number:

QPR Author Name: S. Carpenter and I. Al-Qadi Telephone: (217) 333 - 4188 | % Project Completed: 50%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Establish Literature	07/2005	12/2005	C	C	C	
Task 2: Interface Simulation	04/2006	09/2007		I	I	
Task 3: Laboratory Evaluation	04/2006	03/2007		I	I	
Task 4: Modify ATLAS	01/2006	12/2006		I	I	
Task 5: Overlay Construction	04/2007	06/2007				
Task 6: Conduct Field Performance Testing	04/2007	12/2007				
Task 7: Data Analysis	07/2006	03/2008				
Task 8: Interim and Final Reports	06/2006	05/2008				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Imad Al-Qadi telephone: (217) 265 - 0427 e-mail:alqadu@uiuc.edu	University of Illinois	Samuel H. Carpenter telephone: (217) 333 - 4188 e-mail:scarpent@uiuc.edu

Description of Research: Perform a coordinated lab, computer simulation, and accelerated full scale testing to optimize tack coat type and application rate on PCC having different surface textures. Effect of HMA mix design will also be investigated	Keywords: Tack Coat, Interface, Overlay

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Tom Winkelman	(217) 782 - 2940		08/30/2005	Yes
Amy Schutzbach	(217) 785 - 4888		03/30/2006	Yes
Dave Lippert	(217) 782 - 6732		/ /	
Jim Trepanier	(217) 782 - 9607		/ /	
Charles Wienrank	(217) 782 - 0570		/ /	
Patty Broers	(217) 782 - 3547		/ /	
Terry Hoekstra	(217) 342 - 8345		/ /	
Derek Parish	(309) 671 - 3670		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Evaluation of tack coat types and application rates and PCC surface effects

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Tack Coat Optimization For Overlays	Today's Date: 04/03/2006
	Function Code: IHR-R55

Progress to Date (Limit narrative to what fits on this page):

TASK 1- Current State of Knowledge
A draft literature survey of tack coat applications, interface shear strength characteristics for composite pavement systems and numerical modeling of relevant interface problems has been completed. A copy was distributed during the April meeting to the TRP members.

TASK 2- Interface Simulations
Development of constitutive model for tack coat interface is being investigated. The model will be customized from existing models, such as Coulomb friction, linear or bilinear elastic models, viscoelastic models etc. Considered model should capture fatigue-cyclic response under shearing load. The selected model will utilize ABAQUS simulation routines and will be validated using test data. Computer simulations using ABAQUS has been initiated to test some of the options available to model interface response. Simulating interface models using springs and dashpots, contact, and thin interface elements are being evaluated. The identified model will be calibrated by lab data and then field results.
Preliminary results have been obtained using interface elements approach. In this approach, an elastic material property, 0.5-mm thick tack coat layer, and linear spring contact between tack coat and HMA, and between tack coat and PCC were assumed. Modification is planned to use viscoelastic properties for HMA, defining more accurate tack coat parameters based on lab results, and possibly utilizing a specially designed interface element for tack coat layer.

TASK 3-Laboratory Evaluation
A testing fixture has been identified and major modifications have been completed. A new load cell and amplifier have been purchased and will be incorporated in the fixture soon. Some modifications may be needed to improve testing operation and stability.
The fixture is mounted successfully on an IPC servo-hydraulic system available at ATREL. User controlled testing program has been developed to perform the test in displacement or force controlled cyclic shear tests. The lab testing matrix has been developed based on the approved field testing matrix. Three 100-mm molds were purchased for the IPC gyratory compactor to prepare the HMA+PCC samples for the cyclic shear testing.

TASK 4-ATLAS Modifications
Search for the heating system has been completed.
Companies contacted are Fostforia Industries, Calcana Industries, Mid-Valley Radiants and Industrials, and Vickers Industrial Sales and Solution. Fostoria and Mid-Valley do not provide such type of service.
Calcana can only provide the heaters and the control system need to be purchased and installed separately.
Vickers Industries can provide a complete system of heaters, software (to set-up, run, and monitor), and environmental chamber. Florida DOT has been using a similar system for their accelerated testing facility. Feedback from Florida DOT is positive. The system was discussed at the TRP meeting. IDOT was provided the needed information to provide feed back after discussing the issue w/ Dave Lippert.

Remaining tasks are due to begin at a later date.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Speed Photo Enforcement	Today's Date: 3/31/06 Function Code: IHR-R56 Project Number:

QPR Author Name: Rahim (Ray) Benekohal Telephone: (217) 244 - 6288 % Project Completed: 15%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Task 1- Literature Review	7/05	10/05	I	I	I	
Task 2: Task 2- Select WZ and Collect Field Data	8/05	9/06	I	I	I	
Task 3: Task 3- Analyze Dist 7 WZ data	9/05	5/06	I	I	I	
Task 4: Task 4- Effects of Police and "YOUR SPEED IS" Sign on Speed	3/06	10/06				
Task 5: Task 5- Effects of SPE on Speed and Speed Variation	3/06	10/06				
Task 6: Task 6- Spatial effects of SPE on Speed in WZ	3/06	10/06				
Task 7: Task 7- Temporal effects of SPE on Speed in WZ	3/06	10/06				
Task 8: Task 8- Speeding tickets and Court Decisions	2/06	4/07				
Task 9: Task 9- Prepare Reports	1/07	6/07				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Prof. Rahim (Ray)Benekohal telephone: (217) 244 - 6288 e-mail:rbenekoh@uiuc.edu	U of I Urbana Champaign 205 N. Mathews Ave. Urbana, IL 61801 (USA)	n/a telephone: ( ) - e-mail:

Description of Research: This study will evaluate the effects of using speed photo enforcement (SPE) systems on traffic flow characteristics and safety in work zones (WZ). The overall goal is to determine the effectiveness of SPE in work zones using criteria such as: speed, speeding tickets issued and fraction upheld as valid in courts. The net effects of SPE above and beyond the "typical" traffic control procedure IDOT uses in WZ will be determined. Effects of police presence, "YOUR SPEED IS" sign, and SPE van in work zone alone or in combination will be studied.	Keywords: work zone speed, photo speed enforcement, police presence, dynamic speed sign, photo radar, construction zone speed

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Dennis Huckaba	(217) 782 - 8606	HUCKABADA@dot.il.gov	10/2/05	No
Mathew Mueller	(217) 558 - 1793	MUELLERMW@dot.il.gov	/ /	
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Sharon Haasis	(217) 782 - 0551	HaasisSL@dot.il.gov	/ /	
John Benda	(630) 241 - 6800	jbenda@getipass.com	/ /	
Priscilla Tobias	(217) 782 - 3568	tobiaspa@dot.il.gov	/ /	
	( ) -		/ /	
	( ) -		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: effectiveness of photo speed enforcement in work zones

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Speed Photo Enforcement	Today's Date: 3/31/06
	Function Code: IHR-R56

Progress to Date (Limit narrative to what fits on this page):

This study had planned to collect data in summer/fall of 2005 assuming that the speed photo enforcement vans would be ready for deployment in July 2005. The delivery was delayed and data collection plan had to be postponed. The vans were delivered in December 2005 and the vendor is training the State Police personnel on how to use them. Data collection is planned for the construction season for 2006. Preparations for data collection and analysis have continued.

Task 1- Literature Review- Review the literature on photo enforcement, speed and speeding in work zones.

Task 2- Select WZ and Collect Field Data- Two work zone sites will be selected for data collection. It is anticipated to collect data for seven different work zone conditions. Speeds will be measured at two locations within work zone to determine the spatial effects of SPE.

Task 3- Analyze Dist 7 WZ data- Data from IDOT District 7 for 2004 where they used "YOUR SPEED IS" trailer was analyzed to find the immediate effects and the effects after a few weeks of using the trailer. A report entitled "Speed Reduction Effects of Displaying Speed of Motorists in Highway Work Zones" was sent to IDOT in January 2005. Data for 2005 is being analyzed.

Task 4- Effects of Police and "YOUR SPEED IS" Sign on Speed - The speed reduction effects of police presence and "YOUR SPEED IS" sign will be determined in order to accurately isolate the effectiveness of SPE. Data will be collected when police presence or the sign is used individually and at the same time.

Task 5- Effects of SPE on Speed and Speed Variation - Analyze the data on speed and speed variation/uniformity to determine the effects of SPE on speed in WZ. All seven WZ conditions will be studied to determine the net effects of the SPE system. Multiple comparisons will be made among the seven cases.

Task 6- Spatial effects of SPE on Speed in WZ - Near the photo enforcement van drivers may reduce their speeds, but passing it they may increase their speeds. The effects of the system on speed at a point 1-3 miles downstream from the equipped van will be determined (spatial effect).

Task 7- Temporal effects of SPE on Speed in WZ - When police is present in WZ drivers often slow down, but when police leaves the WZ the speed often increases. This phenomenon may happen with SPE. We will collect data after the van is taken out of a WZ to determine the temporal effects of SPE.

Task 8- Speeding tickets and Court Decisions - Determine the number of speeding tickets issued at those two sites and trace a sample of those tickets to estimate the fraction of tickets that is upheld as valid at courts.

Task 9- Prepare Reports - Prepare a final report on study findings and seek its approval from the TRP. Prepare interim and quarterly progress reports.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Evaluation And Implementation Of Improved CRCP And JPCP Design Methods For Illinois	Today's Date: 3/31/2006 Function Code: IHR-R57 Project Number:

QPR Author Name: Roesler, Jeffery Telephone: (217) 265 - 0218 | % Project Completed: 16%	Estimated Dates		Fiscal Year: 2006			
			JUL	OCT	JAN	APR
Task Title	Start	Complete	SEP	DEC	MAR	JUN
Task 1: Evaluation of DG2002 for Concrete Pavements	07/2005	06/2006			I	
Task 2: Laboratory Characterization of Material Inputs	01/2006	06/2007				
Task 3: Traffic Characterization	10/2005	10/2006			I	
Task 4: Field Survey Review	10/2005	06/2007			I	
Task 5: Calibration and Validation of Design Methodology	01/2007	06/2008				
Task 6: CRCP Model Refinements	10/2006	01/2008			I	
Task 7: Built-in Curl Characterization	10/2006	06/2006			I	
Task 8: Climatic Zone Study	01/2006	06/2006			I	
Task 9: Special Case Studies for JPCP	01/2006	06/2006			I	
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Jeffery Roesler telephone: (217) 265 - 0218 e-mail:jroesler@uiuc.edu	University of Illinois 205 N. Mathews, MC-250 Urbana, IL 61801	telephone: ( ) - e-mail:

Description of Research:	Keywords:
With the recent release of the Mechanistic-Empirical (M-E) Pavement Design Guide (DG2002), many states are evaluating its applicability against their existing design methods. IDOT already has an existing jointed plain concrete pavement (JPCP) design based on M-E principles. However, IDOT does not have a M-E based continuously reinforced concrete pavement (CRCP) design procedure. The objectives of the study are to refine the JPCP design method based on new findings from the past 15 years and to develop and implement a CRCP design process that IDOT can use for routine design.	Concrete pavement design, concrete materials, JPCP, CRCP

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Amy Schutzbach (Chair)	(217) 785 - 4888	schutzbacham@dot.il.gov	09/13/2005	Yes
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Tom Winkelman	(217) 782 - 2940	winkelmantj@dot.il.gov	/ /	
LaDonna Rowden	(217) 782 - 8582	rowdenlr@dot.il.gov	/ /	
Chuck Wienrank	(217) 782 - 0570	wienrankcj@dot.il.gov	/ /	
Paul Niedernhofer	(217) 524 - 1651	niedernhoferpr@dot.il.gov	/ /	
Hal Wakefield	(217) 492 - 4646	hal.Wakefield@fhwa.dot.gov	/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
	IDOT BMPR and Districts New CRCP Design Guide Improved JPCP Design Guide

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Evaluation And Implementation Of Improved CRCP And JPCP Design Methods	Today's Date: 10/11/2005
	Function Code: IHR-R57

Progress to Date (Limit narrative to what fits on this page):

During the first quarter 2006, a preliminary FORTRAN program for calculating CRCP punch-out was completed, which is based on the CRCP punch-out prediction models in the 2002 Mechanistic-Empirical Design Guide (DG2002). A document was also written summarizing the DG2002 CRCP models, questions/comments about the CRCP models, apparent errors or typos in the DG2002 documents, and suggested potential improvements to the DG2002 CRCP models. This technical memo will be shared with IDOT before the next TRP meeting.

The main component missing from the (CRCP) FORTRAN code is the stress prediction algorithm, which was not released in the DG2002 report. DG2002 uses the Neural Network (NN) algorithm to calculate two different stresses. The first one is the corner shear stress on the transverse crack caused by different axle loads, which is used to predict monthly crack load transfer efficiency and shear load transfer deterioration. The other critical bending stress calculated by the NN is on the top of the slab in the transversal direction. This stress is calculated for the temperature and load spectra inputted by the user and then fatigue damage is accumulated, from which punch outs are predicted. Since the NN algorithms are currently unavailable to other researchers, the corner shear stress is assumed. The top tensile stress can be calculated using a modified Westergaard's corner stress formulation or use of an algorithm published by Dr. Zollinger to calculate the top of the slab bending stress was implemented. At this point, a meeting should be scheduled to demonstrate the CRCP design "program" to IDOT and discuss the current limitations of the program and potential areas of simplification and improvement for implementation by IDOT.

In the next quarter, CRCP model refinements will be carried out. Modifications to the monthly crack width prediction module and shear transfer deterioration algorithm will be carried out. The concrete material inputs and traffic characterization for CRCP design will also be analyzed to determine its significance on the design guide.

The first quarter of 2006 for the jointed plain concrete pavement study focused on writing a technical note on characterization of built-in curl for the US-20 slabs FWD tested in October 2005, investigation of mechanisms causing cracking in ramp sections, gathering load spectra data for Illinois, and formulating the effects of temperature on stresses in concrete slabs.

A technical note is almost completed on US-20 FWD testing in order characterize built-in curl on JPCP in Illinois. Initial results show built-in curl levels equivalent to a temperature difference of -5 to -10°F in most cases. However, built-in curl levels were found to be much greater (up to -30°F) at hinged joints due to their low level of load transfer and associated lack of restraint to the slab's curling.

The research team has also started evaluating load spectra for potential use in a new mechanistic-empirical design guide. This portion of the study intends to focus on the impact of variability in load spectra and steer-drive axle spacing on predicted rigid pavement performance through use of both the Mechanistic-Empirical Pavement Design Guide (DG2002) and RadiCAL.

Temperature curling effects are considered in the IDOT JPCP design method. However, curling stresses are typically overestimated when using a linear temperature distribution assumption. The inclusion of nonlinear temperature profile in the slab stress calculation was formulated this quarter and will be implemented into the RadiCAL program to evaluate its effect on concrete pavement fatigue life. This evaluation will determine whether additional climatic considerations should be included in the IDOT design method for different regions of the state.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Cost-Effectiveness And Performance Of Overlay Systems In Illinois	Today's Date: 3/16/2006 Function Code: IHR-R58 Project Number:

QPR Author Name: Imad Al-Qadi/ Bill Buttlar Telephone: (217) 333 - 5966 | % Project Completed: 75%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Survey Districts	07/2005	12/2005	I	I	C	
Task 2: Site Visits and Performance Data Gathering	07/2005	06/2008	I	I	I	
Task 3: Forensic Investigation	04/2006	06/2008				
Task 4: Laboratory Testing	07/2006	1/2008			I	
Task 5: Pavement Analysis	01/2006	03/2008				
Task 6: Demonstration Projects	01/2006	10/2007				
Task 7: LCCA	04/2007	12/2007		I	I	
Task 8: Preliminary Usage Guide	07/2007	06/2008	I	I	I	
Task 9: Project Deliverables	04/2007	06/2008				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
William G. Buttlar telephone: (217) 333 - 5966 e-mail:buttlar@uiuc.edu	University of Illinois	Imad L. Al-Qadi telephone: (217) 265 - 0427 e-mail:alqadi@uiuc.edu

Description of Research: Evaluate the cost-effectiveness of traditional overlay systems used in Illinois and to evaluate recent reflective crack control strategies through laboratory, field demonstration projects, and LCCA. A preliminary guide to assist the pavement engineer in the selection of rehabilitation techniques to control reflective cracking will be developed.	Keywords: Reflective Cracking, Crack Control, Interface, Overlay, Asphalt, LCCA, Life-cycle cost, rehabilitation

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Joe Vespa	(217) 782 - 6538	VespaJW@dot.il.gov	08/30/2005	Yes
Amy Schutzbach	(217) 785 - 4888	SchutzbachAM@dot.il.gov	12/16/2005	Yes
Dave Lippert	(217) 782 - 6732	LippertDL@dot.il.gov	/ /	
Jim Trepanier	(217) 782 - 9607	TrepanierJS@dot.il.gov	/ /	
Aaron Tollive	(217) 782 - 0564	toliverat@dot.il.gov	/ /	
Patty Broers	(217) 782 - 3547	broerspa@dot.il.gov	/ /	
	( ) -		/ /	
	( ) -			

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Field demonstration project Overlay life cycle cost analysis Preliminary user guide

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Cost-Effectiveness And Performance Of Overlay Systems In Illinois	Today's Date: 3/16/2006
	Function Code: IHR-R58

Progress to Date (Limit narrative to what fits on this page):

Task 1. District Survey: A survey has been developed and subsequently revised (in January 2006, per feedback received during the Dec 16, 2005 project meeting) to identify potential projects for study (in addition to currently monitored pavements). We have forwarded the revised survey to Joe Vespa for dissemination across the IDOT Districts. Note that the current survey uses a single survey approach as opposed to the two survey approach used in the original ITRC IA-H1 project. This was done to speed up the process of receiving detailed project information.

Task 2: Site visits and Perf. Data: A site visit was made to Mattis Ave in D5/Champaign this quarter. Detailed crack mapping was conducted by IDOT and UIUC researchers over the entire project limits (roughly from the Springfield Ave crossing to the Kirby Ave crossing). We will continue to make site visits in the upcoming quarter, with a trip to the Peoria area being the first priority, as there are several sites very close to one another in this area. These include IL29 and I-474. The UIUC research team will utilize the images collected by the automated Data Collection Vehicles (DCVs) that capture pavement surface videos. Images were obtained from the Bureau of Materials and Physical Research (BMPR) for three of the selected field projects last month. The purpose of this exercise was to assess the possibility of using these videos as a supplement or even replacement for live field visits. It is not clear whether or not the resolution of the images is adequate for the purpose of eliminating the need for field visits. Furthermore, non-Interstate pavements are only assessed every-other year. In the next quarter, we will compare live crack count results with those obtained by viewing the videos. If nothing else, it is hoped that the videos could be used as a supplement to field data for years where field data was not collected, so that performance history data sets could be more complete, which will help in life cycle costing analyses. These videos would also be useful for presentations of project results.

Task 4: Laboratory Testing: A literature review was conducted, with emphasis on options for permeability testing and interface shear testing. We propose to use a falling head permeability set up for testing of permeability of cores taken from field projects. Unlike standard permeability testing which assesses the permeability of the HMA itself, the goal of this testing will be to estimate the insitu waterproofing benefits of various crack control methods by testing cores taken directly over reflective crack sites. This procedure was used in the ITRC IA-H1 project; however, a custom-made constant head permeability device was used. It is recommended that a more standard test be used this time. We are recommending the test device and procedure used at the Virginia Transportation Research Council (VTRC), as specified in a report by G. W. Maupin, VTRC 00-R24, "Investigation of Test Methods, Pavements, and Laboratory Design Related to Asphalt Permeability." For interface shear testing, it appears that a modification to the current apparatus at ATREL will be needed, since we will be taking 150mm cores. The device is currently set up to handle 100 mm diameter specimens.

Notes:

(1) Weekly project meetings are held at ATREL, at 10 AM on Thursdays. Minutes from most of these meetings are available in electronic format (send a request to buttlar@uiuc.edu, and requested files will be emailed to you) and are also posted on the UIUC ICT R58 SSH server. Remote access to this server by panel members is possible and encouraged. Instructions and passwords are available upon request to Mr. Minkyum Kim, mkkim2@uiuc.edu. This server will also be used to post field data, lab data, pictures, and reports.

(2) The percent project completed statistic is based upon actual average progress across all tasks in the current year vs. proposed progress for the current year. Because the project is anticipated to last for a total of 3 years, the % of work complete for the anticipated 3-year project would be 25%.

(3) We are proposing a meeting with the review panel in Springfield on the afternoon of April 10th. The goal of the meeting would be to discuss this quarterly report and to continue to evaluate and plan field visits and forensic test sampling (mainly coring) on selected projects.

PROGRESS REPORT FOR QUARTER ENDING MARCH 2006

Project Title: Evaluation Of Pavement Damage Due To New Tire	Today's Date: 04/03/2006 Function Code: IHR-R59 Project Number:

QPR Author Name: I. L. Al-Qadi Telephone: (217) 265 - 0427 % Project Completed: 10%	Estimated Dates		Fiscal Year: 2006			
			JUL SEP	OCT DEC	JAN MAR	APR JUN
Task Title	Start	Complete				
Task 1: Accelerated Loading Experiment on the Full-Depth HMA Flexible Pavement Test Sections	01/2006	06/2006			I	
Task 2: Analyze Collected Data from Accelerated Pavement Testing	04/2006	12/2006				
Task 3: Quantify Pavement Damage due to Different Tire Configurations Using Experimental Measurements	07/2006	12/2006				
Task 4: Finite Element Modeling of the Experimental Test Sections	07/2006	06/2007				
Task 5: FE Simulation of Loading Response at Highway Speeds	01/2007	09/2007				
Task 6: Incorporation of Dynamic Tire Impacts and Lateral Loading	04/2007	12/2007				
Task 7: FE Analysis of Overweight Axle Loads	07/2007	06/2008				
Task 8: Life-Cycle Cost Analysis	04/2008	12/2008				
Task 9: Reports and Communication	09/2008	12/2008				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Imad L. Al-Qadi telephone: (217) 265 - 0427 e-mail:alqadu@uiuc.edu	University of Illinois	telephone: ( ) - e-mail:

Description of Research: Quantify pavement damage due to different tire and axle configurations commonly used in Illinois, based on accelerated pavement testing and numerical modeling using the finite element method for moving load simulation	Keywords: Pavement Damage, Tire Loading, Wide base, Simulation

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Mark Gawedzinski	(217) 782 - 2799		/ /	
Rich Telford	(217) 782 - 2984		/ /	
Amy Schutzbach	(217) 782 - 4888		/ /	
Bruce Peebles	(217) 782 - 0570		/ /	
Charles Wienrank	(618) 351 - 5270		/ /	
David Lippert	(217) 782 - 6732		/ /	
	( ) -		/ /	
	( ) -		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected: Quantify pavement damage due to different tire configuration Tire impact on pavement distress

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-782-3547

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Development Of Predictive Design Models To Determine Pavement Damage	Today's Date: 04/03/2006
	Function Code: IHR-R

Progress to Date (Limit narrative to what fits on this page):

TASK 1 and 2:

Because of loading the thin section of the perpetual pavement cells at ATREL (as part of another study), strain responses were collected at this point using wide and dual tires for different levels of loading, tire pressure and speed. Data analyses is underway

Preliminary development of loading simulation using finite element ABAQUS program was performed and will be presented to the TRP during our first meeting soon. The simulation considers the speed of the moving load, tire actual imprint, and measured contact tire pressure.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Effectiveness Of Sealers And Laminates For Concrete Bridge Decks.	Today's Date: 4/19/2006 Function Code: IHR-R07 Project Number: ITRC FY

QPR Author Name: Kelly Morse / Tom Winkelman Telephone: (217) 782 - 7218 % Project Completed: 55%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Literature Search of Previous Research	3/2002	3/2004	C			
Task 2: Survey of Other States Experience and Procedures	3/2003	3/2004	C			
Task 3: Collect Data from Experimental Features (IL02-01)	6/2002	6/2007	I			
Task 4: Evaluate Collected Data (IL02-01)	6/2002	8/2007	I			
Task 5: Evaluate Chloride Content Versus Corrosion Rate	6/2007	8/2007				
Task 6: Develop Product List of Accepted Sealers	8/2007	8/2007				
Task 7: Develop List of Applicable Bridges	8/2007	8/2007				
Task 8: Develop Tests for Sealer Performance and Approval	3/2002	7/2007	I			
Task 9: Write Report of Findings	9/2007	12/2007				
Task 10: Develop or Change Policy	9/2007	12/2007				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Kelly Morse telephone: (217) 782 - 7218 e-mail:morsekl@dot.il.gov	Illinois DOT - BM & PR 126 East Ash Street Springfield IL 62704	Tom Winkelman telephone: (217) 782 - 2940 e-mail:winkelmantj@dot.il.gov

Description of Research:	Keywords:
This research will investigate the performance of bridge deck protectants to inhibit the progression of deicing salts into concrete bridge decks. Evaluations of sealers, laminates, and bituminous membranes will be performed as part of this research effort. Visual surveys and chloride ion samples of the concrete bridge decks will be used as a performance evaluation of the protectants. Surveys and samples are scheduled at the initial time of construction or application, and continuing for a period of five years thereafter. The objective of the research is to develop an approved list of protectant materials, an application procedure, and an application timeframe for bridges.	Concrete, Reinforcing Steel, Corrosion, Silanes, Siloxanes, Polymer Concrete, Bituminous Membranes, Chloride Ion

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Dan Brydl - FHWA	(217) 492 - 4632	BrydlD@igate.fhwa.dot.gov	3/22/2002	Yes
Dave Copenbarger IDOT D6	(217) 785 - 5306	CopenbargerDA@dot.il.gov	8/27/2002	Yes
Doug Dirks - IDOT - BMPR	(217) 782 - 7208	DirksDA@dot.il.gov	4/29/2004	Yes
Mark Eckhoff - IDOT - D4	(309) 671 - 4463	EckhoffMS@dot.il.gov	/ /	
	( ) -	LangKR@dot.il.gov	/ /	
Ken Lang - IDOT - D3	(815) 434 - 8480	PuzeyDC@dot.il.gov	/ /	
	( ) -		/ /	
Carl Puzey - IDOT - BBS	(217) 785 - 4511		/ /	

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
Eval. of Sealers and Laminates for Protection of Bridge Decks	IDOT policy for the future use of sealers and laminates.

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Effectiveness Of Sealers And Laminates For Concrete Bridge Decks.	Today's Date: 4/19/2006
	Function Code: IHR-R07

Progress to Date (Limit narrative to what fits on this page):

2006 1st Quarter
A presentation on the current status of the research was prepared and presented at the annual Materials Engineers Conference, the Transportation and Highway Engineering Conference, and the District 5 Project Implementation meeting. A revision to the 2007 Standard Specifications Book was discussed and proposed to include protective coat on all new construction with the Contractor's option to use a sealant in place of the protective coat.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Evaluation Of Aluminum Highway Sign Truss Design Details And Review Of Traffic Structures Standards	Today's Date: 5/5/06 Function Code: IHR-R37 Project Number: FY 06

QPR Author Name: Douglas A. Foutch Telephone: (217) 333 - 6359 % Project Completed: 95%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Experimental and analytical investigation of Structure 1-Type I-A	3/04	10/05	I			
Task 2: Experimental and analytical investigation of Structure 2-Cantilever	3/04	8/05	C			
Task 3: Experimental and analytical investigation of Structure 3 - Type II-A	3/05	1/06	C			
Task 4: Experimental and analytical investigation of Structure 4 - Type III-A	3/05	2/06	C			
Task 5: Experimental and analytical investigation of Structure 5 - A.M.S. sign	5/05	3/06	C			
Task 6: Laboratory tests of connection specimens	6/05	5/06	C			
Task 7: Laboratory and analytical study of damping systems	6/05	3/06	I			
Task 8: Evaluation of design standards for aluminum sign structures	9/05	4/06	I			
Task 9: Final report	11/05	6/06	I			
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Douglas A. Foutch telephone: (217) 333 - 6359 e-mail:dfoutch@uiuc.edu	University of Illinois 801 South Wright Champaign, Illinois 61820	James LaFave telephone: (217) 333 - 8064 e-mail:jlafave@uiuc.edu

Description of Research: The objectives of the project are to measure and understand the behavior of highway sign trusses and details, verify current design standards for these structures, and if necessary, recommend changes to current design standards. This will require measurement of the response of five sign structures under wind and truck gust loading, measurement of strength of representative connections in the laboratory,and analytical studies. Five sign structures will be studied.	Keywords: aluminum sign structures, wind loads, design standards

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Jon Edwards	(217) 782 - 3586	HODELMJ@dot.il.gov	3/9/05	Later
Myron Hodel	(217) 782 - 3451	EDWARDSJJ@dot.il.gov	/ /	
Chris Mehuys	(217) 524 - 3320	MEHUYSCH@dot.il.gov	/ /	
Aaron Weatherholt	(217) 785 - 5312	WeatherholtAA@dot.il.gov	/ /	
	( ) -	BROERSPA@dot.state.il.gov	/ /	
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Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title:	Today's Date: 05/05/06
	Function Code: IHR-R37

Progress to Date (Limit narrative to what fits on this page):

We have almost finished studying all of the structures that we will investigate. Srtucture 1 (Type I-A) is located on the westbound lane of I72 near the 134 mile post. Structure 2 is a cantilever structure located on the eastbound lane of I72 at the 144 mile post. Structure 3 (Type II-A) is located on the eastbound I72. We have finished taking data on these three signs. Structure 4 (Type III-A) is located on southbound I-555 near Lincoln. We have developed analytical models of all four signs which very accurately represent the actual sign structures. We have also studied the effects of the damping units installed the structures. The damping is very low but also very evident on the cantilever sign equipped with the dampers with longer cables (floppy dampers). There is no added damping for structures equipped with the short cables. We have completed writing the draft report for the cantilever structure and about 90% of the draft reports for the TypeI-A and II-A structures. Wiss Janney and Elstner has completed the data acquisition on Structure 5 which supports a V.M.S and is located near Bloomington. We have received the data from them and are currently studying this sign bridge. We are having difficulty getting the naturan frequencies of the analytical model to match those measured in the field. An interim report will be written for each task given above. These will be summarized in the final report. We proposed some weld details for study in the lab. These were approved. It was recommended that we start with a sign structure that has already been taken out of service and we agreed. J. LaFave will be overseeing this task for the project. Prof. LaFave and Jennifer Rice have been studying two signs that have been taken out of service and had some cracked welds. Based on some preliminary studies on some of the older sign structures it may not be necessary do do destructive tests on joints. There is strong evidence that vortex induced vibration of slender members was a strong contributor to the problem. The calculations indicate that this will not be a problem with any of the new designs because the members are not as slender. We will be sending results of these studies shortly. Task 7 has been redefined as approved by the Technical Review Panel through e-mail discussion. We will be studying the performance of the dampers that are currently be used by IDOT. As mentioned above, sometines they work and sometimes they do not. At the completion of this task we will better able to recommend damper specifications for each sign type. We have done extensive testing of two damper types in our lab. We are currently analyzing the data. We should be finished with this study by the end of March, 2006. One important piece of information that we have discovered as part of Task 8 is that it seems that the current AASHTO design equations predict smaller stresses in the main members than those measured in the field. We believe that this results from two factors. The effective drag and gust factor coefficients in the code appear to be too small. This will We would like to have more time to study these results before reporting them. We would like to request a no-cost extension to June 30, 2006.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2006

Project Title: Investigation Of Select Lrfd Design Factors Through Instrumentation Of Bridge Bearings	Today's Date: 5/1/06 Function Code: IHR-R38 Project Number: ITRC N/A FY 05

QPR Author Name: Brad Cross Telephone: (618) 650 - 2648 % Project Completed: 85%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Bridge Selection and Instrumentation Plan	2/2004	9/2005	C			
Task 2: Instrumentation Installation and Data Collection (first 6 bridges complete, second 6 in progress)	5/2004	6/2006	I			
Task 3: Data Analysis and Final Report	8/2004	6/2006	I			
Task 4:	/	/				
Task 5:	/	/				
Task 6:	/	/				
Task 7:	/	/				
Task 8:	/	/				
Task 9:	/	/				
Task 10:	/	/				

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Brad Cross telephone: (618) 650 - 2648 e-mail:bcross@siue.edu	Southern IL Univ. Edwardsville Edwardsville, IL 62026-1800	Nader Panahshahi telephone: (618) 650 - 2819 e-mail:npanahs@siue.edu

Description of Research: Instrumentation for 12 bridges along I-55 to determine the validity of select factors in the LRFD design procedures.	Keywords: LRFD, instrumentation, shear

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
Tom Domagalski	(217) 785 - 2913	DOMAGALSKITJ	3/17/2004	Yes
Patty Broers	(217) 782 - 3547	BroersPA	6/11/2004	Yes
Mark Gawedzinski	(217) 782 - 2799	gawedzinskimj	11/18/2004	Yes
	( ) -		3/8/2005	Yes
	( ) -		6/13/2005	Yes
	( ) -		10/11/2005	Yes
	( ) -		/ /	
	( ) -			

Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:
Instrumentation Plan 6/11/2004	IDOT and FHWA are the anticipated end users. Results will discuss measured bearing shear forces.

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Investigation Of Select Lrfd Design Factors Through Instrumentation	Today's Date: 5/1/2006
	Function Code: IHR-R38

Progress to Date (Limit narrative to what fits on this page):

Static and dynamic testing on the first six bridges is complete, and long term data collection is also finished. These bridges are:

059-0041
068-0049
068-0046
084-0107
054-0043
059-0041

Six bridges along I-270/70 have been instrumented and tested. Long term (6 month) monitoring began by December 31, 2005 and six months will be complete by the end of June as scheduled. These bridges are:

060-0319
060-0056
060-0028
003-0001
003-0004
003-0006

Data analysis and coordination of the final report is now underway and we anticipate having our first draft to IDOT in mid-May so the TRP can review the work before the project is complete.

PROGRESS REPORT FOR THE QUARTER ENDING MARCH 2005

Project Title: Southbound Kishwaukee Bridge Monitoring Station Follow On Maintainance And Analysis	Today's Date: 04/19/2006 Function Code: IHR-R42 Project Number: ITRC FY 2006

QPR Author Name: Han Chen Telephone: (312) 413 - 2210 % Project Completed: 75%	Estimated Dates		Calendar Year: 2006			
			JAN	APR	JUL	OCT
Task Title	Start	Complete	MAR	JUN	SEP	DEC
Task 1: Perform annual analysis of temperature effects and correction of data.	01/2006	06/2006	I			
Task 2: Perform annual analysis of local deformation data from LVDTs to gage extent of crack growth.	01/2006	06/2006	I			
Task 3: Perform annual analysis of local deformation data from strain gage pairs to monitor major traffic events.	01/2006	06/2006	I			
Task 4: Develop WindowsCE-based sensor substation to replace the old bridge workstation.	01/2006	06/2006	C			
Task 5: Archive annual modal frequency data with statistical comparisons to reference datasets from 1999.	01/2006	06/2006	I			
Task 6: Provide annual estimates of total traffic flow and oversized events and develop real-time analysis strategy.	01/2006	06/2006	I			
Task 7: Document and report annual comparisons between current local and global data measurements and previous	01/2006	06/2006	I			
Task 8: Develop a new DSP device for the crash recovery of sensor substation system.	01/2006	06/2006	C			
Task 9: Improve the algorithms of health assessment and warning system.	01/2006	06/2006	C			
Task 10: Provide data and cooperate with the design consultant on the retrofit plans.	01/2006	06/2006	C			

Principal Investigator Name/Contact:	P. I. Organization Name/Address:	Co-Investigator Name/Contact:
Prof. Ming L. Wang telephone: (312) 996 - 8260 e-mail:mlwang@uic.edu	University of Illinois at Chi Civil and Material Eng.	Han Chen telephone: (312) 413 - 2210 e-mail:hanchen@uic.edu

Description of Research: Provide maintenance, upgrade, and analysis support for the monitoring station, sensors, and acquired data.	Keywords: Pre-processing, Crash Recovery, Health Assessment

Technical **R**eview **P**anel Names:	**TRP** Telephone:	**TRP** Email:	Meeting Dates:	Minutes Available?
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Short Title & Date of Reports Available:	End User(s) and Result(s) Expected:

Instructions for each field appear at the bottom of the screen.
For questions, please contact the Research Coordinator at 217-557-6038.

QUARTERLY PROGRESS REPORT (CONTINUED)

Project Title: Southbound Kishwaukee Bridge Monitoring Station Follow On Maintenance	Today's Date: 02/23/2006
	Function Code: IHR-R

Progress to Date (Limit narrative to what fits on this page):

The long-term monitoring effort on the Kishwaukee south-bound bridge by the University of Illinois at Chicago Bridge Research Center has yielded a variety of data that spans several years. These data include both global measurements (acceleration) and strain and crack opening displacement (COD) data from local deformation gages. The purpose of this effort is to infer possible structural changes from these measurements and to guide retrofit strategies for compromised components. A summary listing of progress to-date, following the task enumeration, follows.

Task 1: Temperature changes have been archived during January through March; temperature compensation according to previous composite fits have been performed. Based on the previous annual record, the temperature effect on natural frequencies and crack opening displacement has been analyzed.

Task 2: On the basis of the measurement of shear crack opening displacement, the shear strains in the web of Segment SB2-N4 are analyzed in real-time. The monitoring system indicates that the shear strains at 8:00 am on February 19 reached the new maximum value 696.5 microstrain. Comparing to the temperature record, that time's temperature was very low (-11.97 degree C), which caused shear strain to increase. The monitoring records show that shear strain values increase when temperature drops.

Task 3: All strain gauges are out of work due to their significant shifts in the long run. Records indicate that this type of strain gauges cannot last for more than 2 years. Alternatives should be chosen to replace them. Traffic information was derived based on the local deformation from LVDT sensors.

Task 4: Development of the Windows CE-based sensor substation has been completed. They are ready to be installed.

Task 5: Average temperature-compensated frequencies follow, for the dates (Jan-Mar 06, Oct-Dec 05, 1999-2000): (1.619, 1.616, 1.611), (2.055, 2.052, 2.058), (2.653, 2.649, 2.638), (3.016, 2.975, 2.949). There are no significant changes in the natural frequency.

Task 6: According to the data in record, the average daily truck traffic (ADTT) in January, February and March are respectively: 2368, 2527, 2827. There are no significant changes as the value in last year. The data distribution indicates that the ADTT during January is smaller than the value in other months. And the ADTT during March is bigger than the value in January and February.

Task 7: Annual Comparisons: nothing to report at this time.

Task 8: The development of a new DSP device for the crash recovery of sensor substation system has been finished and the device has been installed in the bridge. It has been proven that the monitoring system can recover from network failure by the new device automatically. This saved a lot of travel to the bridge.

Task 9: The improvement of the algorithms for health assessment and warning system has been finished in the area of shear stress analysis and fatigue life estimation.

Task 10: Retrofit assessments: finished.

Overall assessment: No significant change was detected in the modal frequencies, crack opening displacements, and shear strains during this quarter, in comparison to the result of year 2005. In this quarter, there are totally less than 15 hours data loss (Jan 19 19:50 to Jan 30 11:20).This is probably caused by service failure from the internet service provider.